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Using Ram-Up-Cores for Castings

Advantages Stressed Are Lower Molding Cost, Better Castings and Less Danger of Spoiled Work

BY PAUL R. RAMP*

MANY valuable articles written on foundry practice have done much to advance efficiency in foundry work. Perhaps too much cannot be written, not only for the information that is broadcast to all who read but for the tendency it has to make readers think, and then to develop greater things than those they read about.

However, we must not neglect the simple things, because the rising generation must know about them, as well as about the most advanced practice and recent discoveries. Without the simple things they will not have the proper foundation upon which to build their foundry education. With this in mind the writer proposes to discuss one of the simple things that has considerable bearing on the quality and cost of castings, namely, "Ram-up-cores."

There are many cases where ram-up-cores are used to advantage. There are many more cases where ram-up-cores could be used to advantage, but are not used because some do not realize their value, and others do not know how to use them. For the benefit of these persons we propose to consider a few cases where a ram-up-core is an advantage in the production of good castings at a reasonable cost, and is better than a core put in a core print.

The first example is a special pipe for a high-pressure steam line, of which Fig. 1 gives two views. The difficulty encountered in making this pipe is the molding of the side branch marked *A*. The pattern must be parted at the line *DD*. This makes it necessary to use a three-part flask, or to use a covering core over the flange, or to use loose flange sections, to be picked in after the main pattern has been drawn out of the sand. All three of these methods are expensive and unsatisfactory, because:

The three-part flask method calls for exceptional molding ability and additional time, and there is more danger of the mold cutting, scabbing and dropping out. The covering core method requires special care in placing and ramming, and there is always the danger of a dropout on the green-sand side of the flange mold that is covered with the covering core. This dropout is caused by the vibration and drawing of the main pattern, because, before the pattern is drawn out of the sand, the flange section already has been taken out of the sand; and unless this part of the mold is very carefully nailed and supported, there is danger of part of it dropping.

The method of making the flange pattern loose and in several pieces, and picking them in after the main pattern is drawn out of the sand, is a slow and expensive process. There is always danger of the molder ramming these loose pieces crooked or too hard, causing the surface of the mold to cut, or too soft, causing the casting to swell.

By the use of a ram-up-core the possibility of cuts, scabs, dropouts and swells is eliminated, because the flange itself is really a dry-sand mold.

Fig. 2 shows the drag half of this special pipe pattern lying on a molding board, with the ram-

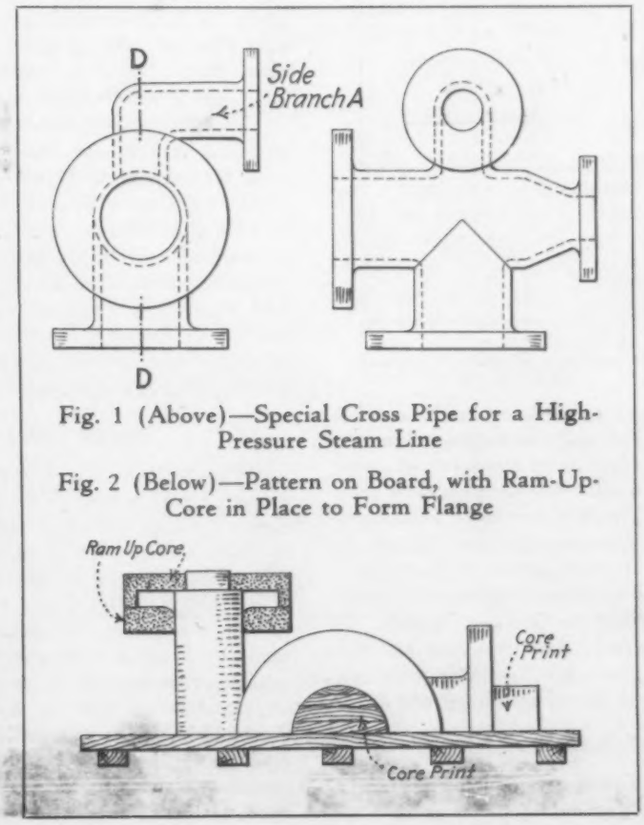

Fig. 1 (Above)—Special Cross Pipe for a High-Pressure Steam Line

Fig. 2 (Below)—Pattern on Board, with Ram-Up-Core in Place to Form Flange

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up-core, which is to form the flange on the branch pipe *A*, in position. In practice, the first operation in this case will be to place the flask on the board and ram the mold up to the point where the ram-up-core meets the green sand; then the ram-up-core will be placed in position as shown in Fig. 2.

This ram-up-core is usually made in two pieces and joined together. One piece consists of a ring core, the opening in the center to conform to the outside diameter

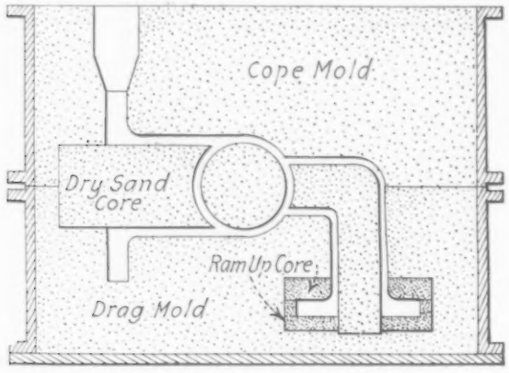

Fig. 3—(Above) Cross-Section of Mold for the Special High-Pressure Pipe Crossing, Showing How the Ram-Up-Core Fits Into the General Scheme

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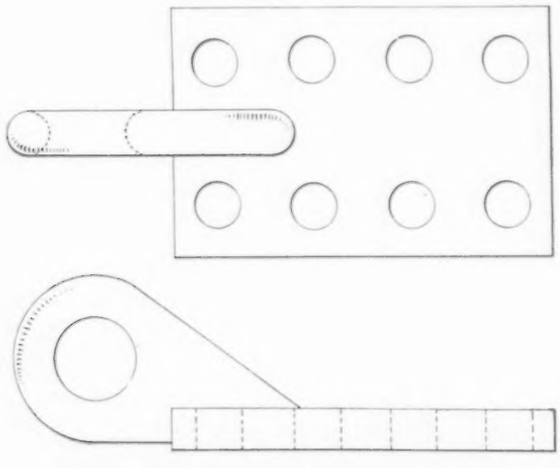
Figs. 4 (Below) and 5 (Right) Are a Cast Steel Lifting Pad and the Drag Mold Used in Making It. The latter shows the ram-up-core in place



of the pattern; the other piece to conform to the outside diameter of the flange required, and the outside diameter of the core print. After the flask is rammed full of sand, the cope part of flask is lifted off. The drag pattern then is drawn and no further work except removing loose sand is necessary, to produce the flange on the side branch *A*.

Fig. 3 is a cross-section of this special high-pressure pipe mold, showing all cores in place, including the ram-up-core which forms the flange on the side branch. It will be noted that the ram-up-core does not cover the end of the side-branch main core, as a much tighter joint can be made by forming the end of the print with green sand.

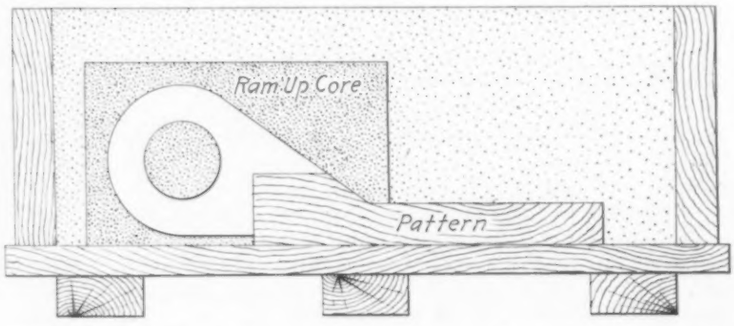
Making a Plate with an Eye-Link

Fig. 4 shows a cast steel lifting pad, which consists of a cast steel plate with a lifting eye-link cast on it.

A cross-section of the drag part of a mold for these lifting pads, rammed full of sand, is shown in Fig. 5, with the pattern and the ram-up-core in place. The customary method used to mold a pattern of this design is to split the pattern and mold the plate section on edge; this makes it possible to form the eye-link section in green sand. The objection to this plan is that a deeper cope must be used, and gaggers and nails must be used to hold the sand in the cope, to prevent it from dropping out when the mold is being closed.

If the upper edge of the plate that is molded in the cope half of the flask is rammed too hard, a blowhole will result, and there is always danger of a blowhole from hard ramming on molds where the patterns extend very far into the cope. The reason for this is that the molder is afraid of a dropout, and unless he is an experienced man he is inclined to ram his cope too hard.

Another disadvantage of a split pattern is the danger of a shift in either the flask or the pattern, and a half pattern in the cope is often rammed out of line, causing a mis-match. Although there may not be a shift in castings made this way, there will be a seam or fin in the casting, produced by the parting line. And if there is no shift with the split pattern, there would always be a high



point in the center of the plate, where the cope and the drag mold join, because it is necessary to allow draft on the two halves of the pattern, and this produces a high place in the center of the plate. Another objection to this plan of making these link pads is that it requires more time to mold a split-pattern job than it does a flat-back, and a more experienced molder.

With the ram-up-core as shown in Fig. 5 the job becomes a very simple flat-back which does not require an experienced molder to make. The eye-link is made perfectly with no shift, and the surface of the plate section is straight, with no high points or parting lines to be chipped off. With the ram-up-core it is not only possible to make the mold more cheaply, but the cost of cleaning and chipping a steel casting of this character is reduced one-half. The additional cost of making the ram-up-core is only a small percentage of the time and labor saved by its use, and a much better casting is produced.

Making Pulleys by This Method

Often we are obliged to make special pulleys of a small diameter with a wide face. This design produces in a mold a delicate ring pocket of sand that is very hard to secure in green sand. And often, after it has been properly secured, the question of venting this frail column of sand is a problem. Fig. 6 is a cross-section of a small pulley of this character; the inside part of this pulley mold is made by using a ram-up-core.

This ram-up-core is dropped into the pattern before any sand is put into the flask; after the drag portion of the mold has been rammed, the flask rolled over, the joint made, and the cope half of the pattern placed in the proper position, another ram-up-core is dropped into the cope pattern. The cope ram-up-core is provided with a

sprue which leads to the hub section of the pulley mold.

This plan eliminates the necessity of rodding the green sand ring pocket, and prevents a cut or a scab at the points indicated by the letters *AAAA*. It also makes it possible to gate the mold on the hub section, which assures a cleaner face on the pulley. In making ram-up-cores for a pulley of this kind, it is advisable to have the outside diameter of the ram-up-core come flush with the outside diameter of the pattern, as is the case in Fig. 6. When the ram-up-core is allowed to extend over the outside diameter of the pattern, there is always danger of soft spots being produced in the green sand section of the mold, under the ram-up-core where it joins the pattern, which would result in a swell, producing a deformed casting. Many similar castings with deep pockets can be more economically produced with a ram-up-core than by placing a core in a core print, or attempting to make the mold in green sand.

Ram-Up-Cores Need Adequate Support

When ram-up-cores are made for deep, narrow pockets they must extend into the green sand far enough to enable that portion of the mold to carry their weight. This is to prevent the ram-up-core from dropping out of the mold when the cope is placed on the drag. Of course, it is possible to hold a ram-up-core in place with wire, nails or chaplets. But one of the important things about ram-up-cores is that, if they are properly made, they eliminate the necessity for nails, wire or chaplets.

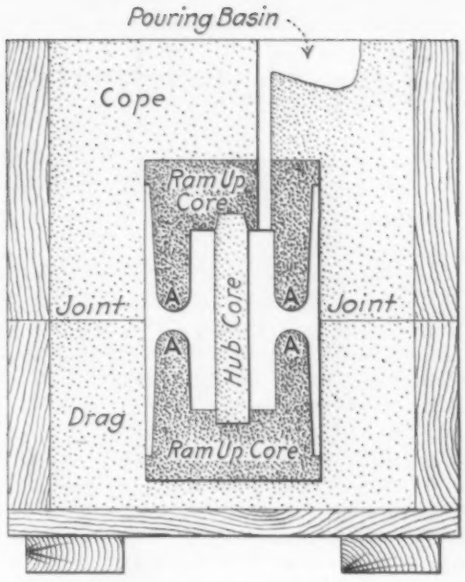


Fig. 6—Cross-Section of Small Web Pulley Mold, Showing Ram-Up-Cores in Cope and Drag and the Hub Core Fitting Between Them. In this case the only contact between molding sand and casting is on working surface of pulley

Quality Castings and Large Use of Scrap

USE of scrap in mixtures is a problem which concerns every iron and steel foundry today, declared E. K. Smith and F. B. Riggan, metallurgist and associate metallurgist respectively, Stockham Pipe & Fittings Co., Birmingham, Ala., at the recent annual convention of the American Foundrymen's Association at Chicago. Every furnace has to consume a portion of scrap, ranging from a moderate amount of remelted gates, etc., up to 100 per cent scrap mixture, they asserted, in a paper entitled "The Use of Scrap in Gray Iron, Malleable and Electric Steel Mixtures." Associated with this problem is a question of great importance—how to maintain a steady improvement in the quality of the product.

Charges Containing Up to 100 Per Cent Scrap

The authors, in their 20-page paper, take up many phases of the scrap problem, giving analyses of some of the common grades for the various kinds of castings, as well as a discussion of specifications. The effect on the product of varying percentages of scrap in the mixtures is illustrated by photomicrographs of 100 and 500 diameters, showing ranges of 25, 50, 75 and 100 per cent scrap. A valuable section is devoted to effects of borings, tin, zinc and burned material.

Rapid progress in becoming nationally organized is being made by the scrap industry, declare the authors. Cooperation between purchasing agents, scrap metal dealers and the Department of Commerce has resulted in specifications suited to all types of furnaces and to all grades of scrap. To keep in step with improved quality, both the process and the selection of materials must be under closer control.

Future Scrap Yards Will Have Balers and Furnaces

The scrap yard of the future will probably be equipped with briquette machines, balers, furnaces, magnetic separators, and even a chemical laboratory. It is an individual problem for each foundry to decide what kind of scrap it can use and how much of it. In most cases relatively small amounts of scrap may be used with improvement in quality and some saving in cost. There is a place where each kind of scrap metal can be used to advantage, whether in the air furnace, cupola, electric or blast furnace.

Some exception was taken to the statement of the authors that, after adding both tin and zinc to the ladle where 100 per cent scrap gray iron was used, little effect was found either in the analysis or in the physical property of the product. In ordinary practice, however, the zinc probably volatilizes and it seems probable that tinned or galvanized material in moderate amounts will have no effect on the quality of cast iron.

One speaker, in questioning the results as to the effect of tin, stated that 5 per cent tin in a mixture had lowered the transverse strength of the castings from 3750 to 2350 lb., and E. J. Lowry, consulting metallurgist, Detroit, declared that the tin is absorbed and becomes a hardener.

Heat Transfer From Gases to Solids

The efficiency of a blast furnace or gas producer depends upon the proper transfer of heat from moving gases to colder solid particles. In general, heat transmission is a function of the physical properties of the mass of solid particles.

The North Central experiment station of the United States Bureau of Mines, in cooperation with the University of Minnesota, Minneapolis, has started an investigation for obtaining quantitative information which will guide operators in making such innovations in practice as will best satisfy thermal requirements.

The transmission of heat from water flowing through a bed of steel balls about 1 in. in diameter is being studied first, with a view of finding some fundamental relations that can be applied to systems in which heated gases are passed through a mass of low-conductivity particles.

Tin Pot Heating by Radiation from Incandescent Bed of Refractory

BY F. W. MANKER*

BUILDINGS and mechanical equipment for the tin mill recently built by the Youngstown Sheet & Tube Co. at East Chicago, Ind., were designed to permit the product to flow continuously and progressively through the operations in the quickest and most economical manner. The departments are so located that the sheet bar, when unloaded from the cars, passes through one building and one process after another progressively, until the finished product is loaded into cars on the other side of the plant.

Hot mills, housed in a separate building, consist of 24 mills with 24 pair and 24 sheet furnaces. In front of the rolls, in a lean-to off the main hot mill building, are the squaring shears and opening floor, where the sheets are sheared and opened, weighed and assembled according to order.

Box annealing has been made continuous and automatic through the installation of a kiln-type furnace, gas fired and equipped with automatic heat regulators. The pots containing the sheets are placed on trucks and then charged in the furnace.

Cold rolling equipment is in a lean-to between the black and white annealing buildings. There are 10 trains of rolls, three sets of rolls in each train, with conveyors between the sets, to carry the sheets automatically through.

After white annealing, the sheets go to the white pickling department, where they are again pickled, to obtain clean steel before coating. Immediately after pickling, they are placed in steel boshes containing water, to prevent oxidation during transportation between the two processes.

There are 20 tinning stacks, each with an automatic continuous tinning machine. This equipment consists of three main parts: the tin pot which holds the molten tin, the tinning machine and a combustion chamber heated with a special system of combustion.

The pot, partly filled with molten tin, is divided by an apron reaching part way down from the top. The back end is filled with palm oil, which rests directly on the tin, and is partly insulated from it with a coating of dross.

In a compartment in the front side of the pot the sheets are placed on end, slanting slightly toward and against the front side for feeding to the machines. The first set of revolving rolls is located in this compartment and a magnet within draws the first sheet over until it contacts and is drawn through.

Feeding from one set of rolls to another, the sheets pass up over the side of this compartment, down into the tin bath, under the apron, through the tin machine, up through the hot palm oil to another set of rolls in the catcher. The catcher flops the sheets over on to a slide, from which they proceed to a roller conveyor for transportation to a cleaning machine. The coating of tin is acquired in the tin bath and the hot palm oil serves to smooth and even up the coating as the sheets pass through the rolls.

As the temperature of the tin bath must be maintained within very close limits, a system of firing was installed by which close control is possible. The bottom of the pot is on the floor level and the combustion chamber is below. A deep brick structure serves as a foundation and in the front of this, just under the front edge of the pot, is the combustion chamber.

A row of gas burners fire into this chamber at an angle so that the flames impinge on a bed of broken refractory. This bed is heated to incandescence and the heat is transferred directly to the bottom and front side of the pot through radiation. This system was designed and installed by the Surface Combustion Co., Toledo, Ohio.

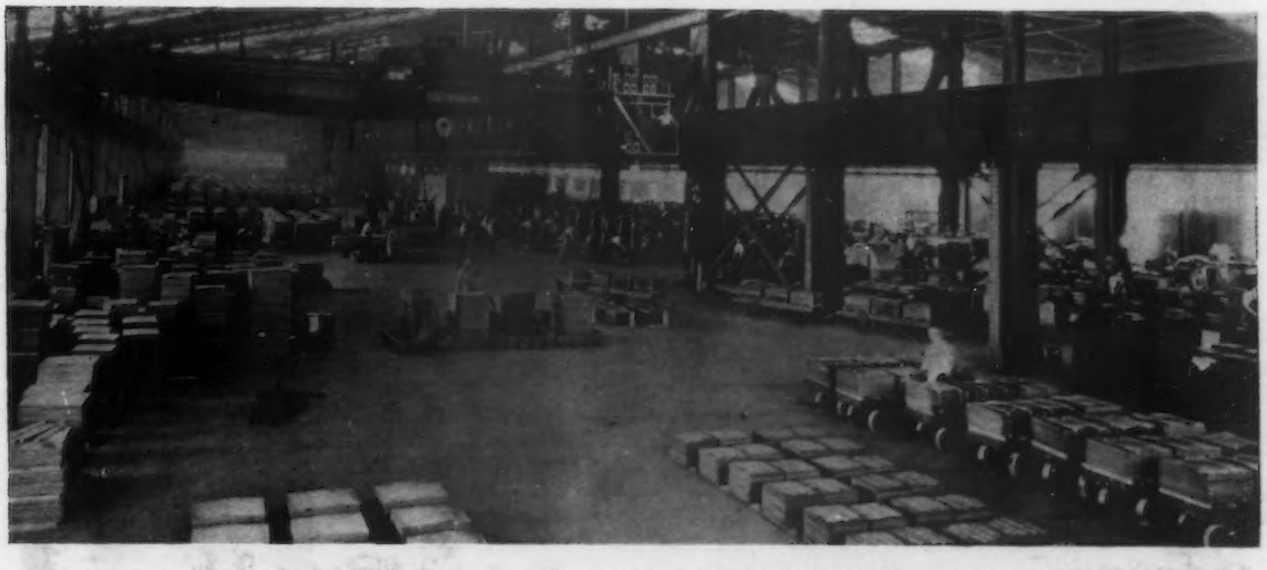
Five gas burners are spaced at equal intervals along the length of the combustion chamber, one manifold serving three and another two. Each manifold is provided with a gas-air inspirator of the venturi type. A flue at one end of the combustion chamber removes products of combustion, and a damper is installed by which the pressure in the chamber is maintained constant.

*Assistant to the president of the Great Lakes Steel Corporation, Detroit. General description of the Youngstown company's sheet and tin mills was given in our issue of Oct. 14, 1926, page 1062.

Row of Tinning Units, Each Containing Gas Furnace, Tin Pot, Automatic Tinning Machine and Scrubber

Charging End of Sheet and Pair Furnaces, Showing Arrangements for Handling Sheet Bar and Fuel

Hot Rolling Mills, with Sheet and Pair Furnaces at Left. Cooling air comes from the cowls shown



In the Annealing Department, Showing Ample Area for Handling the Product

Silica as a Refractory Material

Consideration of Its Use in Steel Industry— High Melting Point Essential— Relations to Other Oxides

BY ROBERT B. SOSMAN

REFRACTORIES and slags together bear the same kind of a relation to the manufacture of steel that the soil bears to the growth of corn and wheat. In both cases the principal constituents come from without, yet the soil contributes its own small proportion of useful substances and in various other ways is an important factor in the final yield.

Silica as Raw Material

One type of requirement for a good refractory material will be recognized as fundamental by every one connected with the industry; it must be abundant and accessible enough to make it cheap. Silica meets this requirement in such high degree as to place it in a class by itself when compared with other refractories.

It is regrettable that so popular a material should have its faults, but the recognition of faults must precede the introduction of improvements, and I propose therefore to consider the following weaknesses exhibited by silica when used as a refractory:

(1) Its low melting-point,
(2) Its irregular thermal expansion,
(3) Its activity in slagging with other oxides.

Melting-Point

Melting-points of some common refractory oxides are as follows, in deg. C.:

Magnesia	MgO	2800
Lime	CaO	2570
Alumina	Al_2O_3	2050
Chromium oxide	Cr_2O_3	1990
Silica	SiO_2	1713

The melting-point of silica given is only the highest of three different points, for there are three distinct crystalline forms or modifications of silica, each of which has its own melting-point. These forms are:

Quartz melts at deg. C.	1400
Tridymite melts at deg. C.	1670
Cristobalite melts at deg. C.	1713

The melting-point of quartz is given in this list as 1400, but you will have to exercise a great deal of patience to induce it to melt at that temperature. Silica belongs to a limited class of substances which are characterized by a very slow rate of melting. The diagram shows that quartz if held at 870 deg. C. would change into the form known as tridymite. On slow heating this in turn converts itself into cristobalite at 1470; the latter melts at 1713. But these changes are sluggish. Quartz can be heated several hundred degrees above its melting-point and, if the heating has been done quickly, it can be cooled again without showing any essential change. Reverse changes are also sluggish; tridymite, cristobalite and vitreous silica are all obtainable with ease at ordinary temperatures, and will stand unchanged for years, although thermodynamically unstable.

The melting-point of cristobalite is unfortunately just at or a little below the most effective operating temperature of the open-hearth furnace. 1713 deg. C. is the absolute deadline for the silica roof. Nothing can be done about this limitation, because as a general rule the addition of anything to a pure substance lowers the temperature at which it will liquefy.

Thermal Inversions and Expansions

The second important limitation of pure silica as a refractory is found in the sudden expansions which the forms undergo at relatively low temperatures. The diagram shows that each variety of SiO_2 has changes (similar to the allotropic modifications of steel) at fairly low temperatures. These are associated with consider-

This is abstract of a paper read May 24, before the American Iron and Steel Institute, at New York, and of the discussion which it occasioned.

BORN in southern Ohio in 1881, Robert B. Sosman was graduated from Ohio State University and in 1907 was given the degree of Ph.D. in physical chemistry by the Massachusetts Institute of Technology. After two years with Arthur D. Little, Inc., Boston, he was a physicist at the geophysical laboratory of the Carnegie Institution of Washington until 1928. In the war he was consulting chemist to the nitrate division of the Bureau of Ordnance. He is a past-president of the Washington Academy of Sciences and of the Philosophical Society of Washington. He is now physical chemist, research laboratory, United States Steel Corporation, Kearny, N. J.

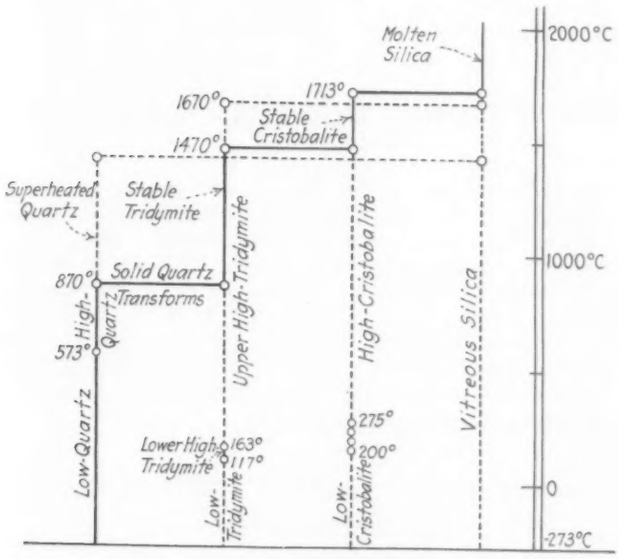
able change in volume, that of tridymite is least, of cristobalite greatest.

Three ways suggest themselves by which the difficulty due to these sudden expansions can be materially diminished:

1. Decrease the amount of sudden expansion.
2. Decrease the suddenness of the expansion.
3. Improve the mechanical qualities of the refractory.

The first possibility has already been suggested in comparing tridymite with cristobalite. Tridymite has a very small expansion at both of its two inversion points. A brick consisting entirely of tridymite will therefore have very little more likelihood of spalling than a common building brick of the same size. Modern practice in brick making consists of a more or less complete conversion of the original quartz into cristobalite, which is the first result of heating at high temperatures; there is also an effort toward an increasing conversion of the cristobalite into tridymite.

There seems to be no other practicable way of reducing the *amount* of expansion. It may be remarked in



Temperature Chart of Changes in Stable Forms of Silica, and High-Low Inversions Associated with Expansion or Contraction in Volume

passing that it is quite hopeless to attempt to resist this expansion mechanically. Everyone knows the futility of trying to resist the expanding power of water when it freezes. We are dealing with a change which is not something superficial; it begins with the atoms themselves. It is true that the temperature of inversion of cristobalite can be changed by pressures, but the amount of pressure necessary to raise such an inversion point from 200 deg. C. up to a temperature where it would be harmless would be measured in thousands or millions of tons per square inch, certainly in pressures far beyond the strength of any ordinary engineering structures, such as can be built around a furnace.

A second possibility for improvement is to decrease the suddenness of the cristobalite expansion. Cristobalite which has been made at 1300 deg. C. has a lower inversion point than cristobalite which has been made at 1600 deg. C. Likewise, cristobalite made from vitreous silica shows a different inversion-temperature from cristobalite made from crystalline quartz.

Suppose we can find some practical way of making cristobalite on a large scale in a succession of batches which will show different inversion points; these might then be mixed and bonded to make a brick in which the inversion point would not occur suddenly at one temperature, but would be spread over a range of 50 deg. or 100 deg. C. It is quite obvious that the suddenness of application of the stress will be very much ameliorated.

I am not at all sure but that this very thing is unintentionally accomplished in present practice, by the mixing of material of various degrees of fineness. The very fine grains of quartz probably transform to cristobalite while the temperature is still rising, while the coarse particles are only transformed during the soaking period.

The third possibility is of a very different character from the two just mentioned. It lies in the improvement of what may be rather inaccurately called the "elastic qualities" of the brick.

It is ordinarily forgotten, when we speak of the fracture of a brittle substance by irregular heating, that we must take into consideration physical qualities not ordinarily shown by crystalline substances, namely, fluidity and plasticity. The interstitial silicate glass in a silica brick may show a measurable fluidity in yielding slowly to very small stresses, or it may show plasticity in beginning to flow only at some definite stress below which it is unaffected. In either case, the resulting readjustment will relieve the stress that is caused by unequal heating.

Relations of Silica to Other Oxides

The bonding of silica particles into brick and the reactions between finished brick and slag or hot dust involve a consideration of the reactions between silica and the oxides of lime, alumina and iron.

Data of most fundamental importance have been supplied only within the last year or two by the researches of J. W. Greig at the Geophysical Laboratory in Washington. His work amplifies and extends a series of researches on silicate systems that had been carried forward in that laboratory during the preceding two decades.

From a detailed study of these equilibrium diagrams it appears that the calcium silicate which cements the grains of cristobalite and tridymite in the cold brick, must be present as a liquid at the working temperature of the furnace, and therefore of little effect as a bond. It seems rather that the cristobalite and tridymite grains themselves must have grown together to make a continuous, though porous, structure, something like a sponge.

The so-called lime bond is a low-temperature bond only. It may act as a mortar between the grains of the green brick, and it may subsequently become a vitrified cement after the brick has been fired in the kiln and cooled, but it is a fair question whether it serves any useful purpose at all at the higher temperatures. These facts suggest at once the possibility of making a brick of pure silica with no additions whatever.

Experiments in this direction have been made, but without much success. The most recently recorded experiment on the making of standard-size silica brick without the addition of any bond gave brick that were slightly more porous but only about one-half as strong at ordinary temperature as lime-bonded brick.

The desired result is a mechanically rigid aggregate of crystals of cristobalite or tridymite, either intergrown like the fibers of a textile or felt, or in molecular contact face to face so that the crystals adhere with the strength characteristic of chemical combination. Perhaps this result can be secured with the aid of added substances which will serve only the temporary functions (1) of a bond for the green brick, and (2) of a catalyst for the intergrowing or autogenous welding of the crystals; and which will then disappear entirely. Only con-

tinued research and experimentation can sound out these possibilities.

Care Adds to Life of Silica Brick

ABOUT one-third of the brick, which number roughly 10 for each ton of steel made in the open-hearth furnace, are of silica, said Dr. J. S. Unger of the research department, United States Steel Corporation, in discussing Mr. Sosman's paper. For this type of brick there is no real substitute. These brick have a certain amount of iron oxide in them after they have been in use, particularly those employed in open-hearth roofs. This iron oxide, together with a small amount of lime, come into the brick through having been taken up from furnace fumes. This leads to the thought that perhaps it might do well to add a certain amount of iron oxide in the mixture of which the brick are made. The iron oxide seems to be at least as good a binder as the lime customarily used.

Over the acid open-hearth furnace the roof lasts approximately four times as long as that over the basic furnace, although both are made of the same material. It happens that the fuel cost in making steel is about twice as much for each ton of steel as the brick cost. For this reason it is more economical to run the bricks to early destruction than it is to burn extra fuel, and the furnaces are often operated on this basis.

Three characteristics of silica brick were outlined by Walter H. Kelly, refractories engineer of the Bethlehem Steel Co. These are: their rigidity under furnace temperature and pressure conditions, the negligible spalling which they show under these conditions and their fluxing action. Manganese and chrome brick fail under temperature conditions of 2550 to 2600 deg. Fahr. Silica brick, however, maintain their strength pretty well almost up to their melting point of 1730 deg. C. or 3115 deg. Fahr.

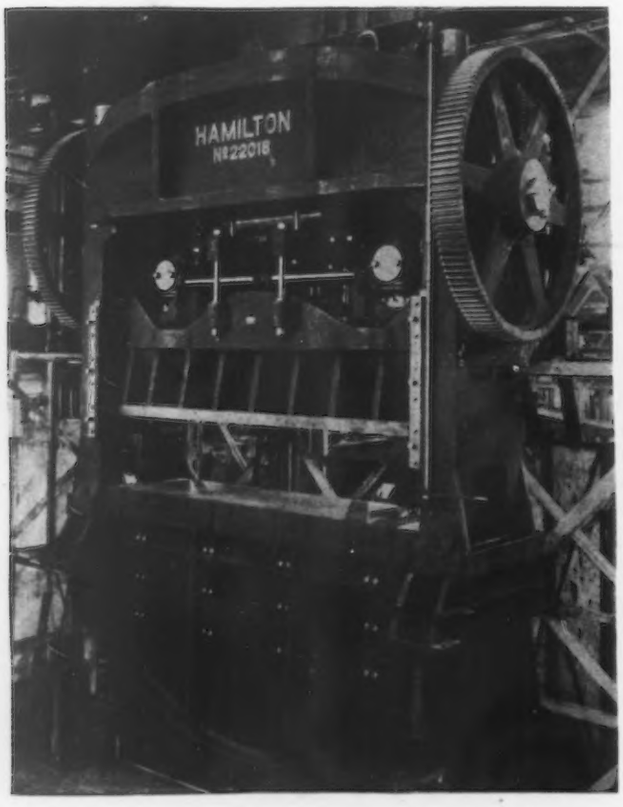
If silica brick are kept always above a dull red heat, they can be subjected to violent temperature changes without much danger of spalling. It is only when they are allowed to cool below a dull red heat, and are worked back and forth through that temperature range, that trouble comes in. In particular, if they are heated too rapidly from a cold furnace they will spall.

New Press Increases Automobile Frame Side-Rail Output

TWO automobile frame side-rails are formed simultaneously by the 2000-ton press illustrated, production being at the rate of 720 side-rails or 360 frames an hour.

This machine, thought to be the largest of its kind, has enabled the Detroit plant of the Midland Steel Products Co. to increase its output and at the same time maintain high standards of quality. It was designed by the Midland company in cooperation with the builders, the Hooven, Owens, Rentschler Co., Hamilton, Ohio. Maximum strength and rigidity, in order to eliminate, as far as possible, deflection in the bed, slides, crankshaft and crown, were primary aims in designing the machine. The bed is a one-piece casting and weighs 90 tons. The slide weighs 45 tons and the arch 70 tons, the total weight of the machine being 400 tons. The height overall is 33 ft.

A duplicate of this press is being built for the Midland company's Cleveland plant, the arrangement and some of the methods of which were described in THE IRON AGE of July 5, 1928, page 19.



Press of 2000 Tons Capacity Installed in the Detroit Plant of the Midland Steel Products Co.

Large Carbon Deposits Inside of Blast Furnace Explained

Deposits of carbon, several inches away from the hot face of the upper part of a blast furnace, have been found on some corroded brick where the temperature does not exceed 500 to 600 deg. C. This phenomenon is reported by D. W. Hubbard and W. J. Rees in a paper read before the Glasgow, Scotland, meeting of the Ceramic Society recently. This product was assumed to be the result of a dissociation of carbon monoxide and the research was made by the authors to discover the probable causes of this deposit.

In the paper the authors describe the experiments and the apparatus in detail and discuss the results, a brief summary of which follows: The following catalysts (agents which do not undergo any permanent change themselves) promote dissociation of carbon monoxide at the temperatures or ranges of temperatures given: Pure kaolin, 450 and 470 to 495; pure silica, 520 to 570; pure alumina, 260 and 350; firebrick, 410 and 430 and 500; kaolin treated with aqua regia, 430, 480, and 520 to 545; silica brick, 530 to 540; re-burned firebrick, 380 and 470; Scottish firebrick, 340 to 450 and 470 to 500; calcined clay, 300 to 400; calcined dolomite, 370 to 770; and pure ferric oxide, 300 to 700 deg. C.

Mellor's theory of the decomposition of clay was supported. It was found that the better burned a brick was, the less was the dissociation; the latter could also be reduced by decreasing the iron oxide content of the clay. The burning of a brick appeared to bring out the lower (alumina) and the higher (silica) temperature effects.

Less Noise—Better Work

Sound-Absorbing Walls and Ceilings Improve Working Conditions in Factory Office—Mechanical Ventilation Contributes to Comfort

AS a noise producer a well-populated factory office, with its chorus of typewriters, adding machines and human voices, often runs a close second to many of the factory's manufacturing departments.

Sound is energy and, once produced in a confined room, will continue to exist until absorbed by the boundary surfaces, or leaks through the doors and windows. Although the desirability of noise prevention, both within and outside of buildings, has been much discussed, actual measures to subdue noise are, in the industrial field at least, still something of a novelty.

A recent example of progressiveness in dealing with this problem is found in the new administration building and employee's auditorium of the Bristol Co., Waterbury, Conn., the walls and ceilings of the several rooms of which have been soundproofed by the application of ¾-in acoustic felt. The felt on the walls extends to the top of the wainscoting and is covered by a special acoustically painted muslin, the finished appearance being comparable to high-class plaster work. The felt on the ceiling is covered by a perforated and painted material that resembles oilcloth in appearance. In addition the concrete floors are covered with 5/16-in. thick rubber.

In a sense this acoustic treatment may be thought of as a "carpeting" of the walls and ceiling, except that carpeted floors are credited with a sound absorption value of only 15 to 25 per cent, whereas the wall and ceiling treatment used in the Bristol company's building is accorded absorption up to 80 per cent of the noise produced in the various rooms. The familiar quieting effect of carpet in an otherwise hollow and reverberant room may thus serve as a comparative basis for comprehending the effectiveness of this wall and ceiling treatment.

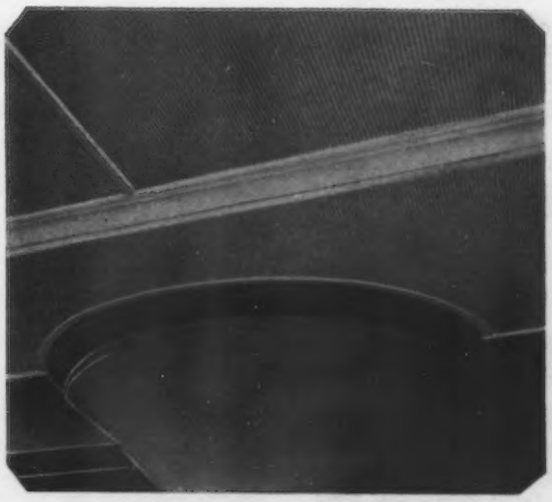
The building so treated is a three-story, U-shape, steel, concrete and brick structure with frontage of 90 ft. and a maximum depth of 145 ft. It houses the executive offices, publicity, accounting and sales departments, and an auditorium for foremen's meetings and other employee activities. The auditorium occupies one leg of the building; the reception hall, executive offices, directors' room, publicity, accounting and sales divisions occupy the front and other leg.

The publicity division, with the printing and supply departments, is in a 36 x 90 ft. room in the basement, the accounting division in a 36 x 70 ft. room on the first floor, while the sales division occupies several rooms on the top floor. The latter comprise offices, small conference rooms and one large demonstration room, upon the walls of which are displayed the various types and styles of recording instruments manufactured by the company. The auditorium is 58 ft. long by 36 ft. wide and has a 15 ft. ceiling, the ceilings of the other rooms, being 10½ ft. high.

On each floor are women's rest rooms, fully-tiled wash rooms and outside record vaults, while commodious locker space is provided for employees in the basement.

The sound absorbing material used is known as Akousticos and is made by the Johns-Manville Corporation, New York. It is an asbestos fiber and hair combination that possesses porosity and flexibility. The perforated covering for the ceiling felt is known as Kribble cloth, the name being derived from cribble, the dictionary definition of which is coarse sieve with round holes. This material is painted and perforated before being cemented to the felt, the object of the perforations being to increase the sound absorbing qualities of the bare felt over the entire scale of pitch.

In addition to absorbing a high percentage of sound of the average pitch of office noises, the felt is fire resistant and a reflector of light. The walls, painted cream color, are credited with a light reflecting factor of 73 per cent, while the ceilings, done in white, have a light reflecting factor of 63 per cent, these percentages being comparable to the standard factor of 88 per cent for carbonate of magnesia. The appearance of the walls and ceilings is pleasing, and the covering materials may be cleaned or redecorated economically without materially affecting the sound absorbing qualities. The ceilings may be washed like a lacquered surface or painted with flat wall paint by means of a special process that obviates filling up the perforations in the Kribble cloth.



Treatment of the Ceiling Is Shown Above, with the Perforated Kribble Cloth Covering the Felt Layer, to Which It Is Cemented

Along with the sound proofing, there are several other features that assure comfortable working conditions for the 100 or more employees in this building. One of these is the "outside" location of all record vaults, and the other is the attention to ventilation.

Each division, accounting, sales and publicity, has a large steel-furniture equipped record vault. Each vault has

Decorative Frieze Above the Upper Windows, Three of Which It Spans

three large wire-mesh glass windows that provide both daylight and fresh air, permitting those working in the vaults to do so with as much convenience as in any other room in the building.

A mechanical blast system that supplies clean and tempered air at the rate of 20,680 cu. ft. per min. is supplemented by a mechanical exhaust system that removes impure air at the rate of 14,000 c.f.m. Fresh air may be supplied mechanically to all rooms, and impure air exhausted mechanically from all but the private offices. The system is designed to exhaust 80 per cent of the supply, creating a slight plenum pressure. Mechanical exhaust was not provided for the private offices because it was desired to maintain a higher pressure in those rooms to eliminate drafts.

Air Is Washed and Humidified

Fresh air is taken from the outside, tempered, drawn through an air washer and humidifier and is then reheated and discharged into the various rooms, including the auditorium.

The fresh air equipment includes a B. F. Sturtevant No. 100, design 1, double-width Silentvane fan coupled to a 7½-hp. a. c. motor. The fan, of the same general type as those used in the Holland Vehicular Tunnel, has capacity of 20,700 cu. ft. per min. against 1.4 in. resistance.

There are two tempering coils, each consisting of four rows of 1-in. pipe, with total heating surface of 668 sq. ft., and two reheating coils, one of four row and one of two rows, made up of 1-in. pipe. The air washer and humidifier is a 6 x 7-ft. Sturtevant type C, with humidity control equipment and motor-driven centrifugal pump for recirculating the water. The humidifier is furnished with two banks of spray heads having deflectors on the entering side and with vertical eliminators and flood nozzles, marine type electric light, pressure gage and large glass-paneled access doors. Casings connect the fresh air intake to the tempering coils, the tempering coils to the humidifier, humidifier to the reheaters, and the reheaters to both inlets of the fresh air fan. Louvres are furnished in the fresh air intake and louvre dampers are provided for shutting off the outside air when the fan is not running.

The exhaust equipment consists of a Sturtevant No. 100, design 1, Silentvane fan, single-width, single-inlet, direct-connected to a 5-hp. electric motor with starting compensator. The capacity is 14,000 cu. ft. per min. of air against 1-in. static pressure. This equipment is not operated continuously when adequate ventilation is to be had by means of the unusually large Austral type windows in each room, although even at such times the mechanical blast and exhaust system is put in operation for 5 or 10 min., four or five times each day.

Benefits Are Real, Though Intangible

Return on money invested in these improvements is derived from increased general efficiency made possible by the elimination of distractions caused by excessive noise, of wasted energy due to poor lighting and of the discomfort and slowing down caused by inadequate ventilation. Then there are considerations of improved morale. The building, at extra expense, is pleasing architecturally, and the unusually good working conditions, no doubt appreciated consciously or unconsciously by the employees, tend definitely to minimize labor turnover.

Wider Use of Aluminum Alloys in Busses and Trucks

USE of aluminum alloys in the manufacture of truck and bus bodies and chassis is increasing. In the modern bus, where light design, as well as strength and durability, are prime requirements, the trend toward aluminum alloys in the manufacture of component parts is especially apparent. One prominent truck manufacturer is using an all-aluminum radiator shell, the upper and lower portions acting as reservoirs. In the process of casting, threads are included for securing the radiator cap. This same manufacturer is using aluminum alloy side boards, extending from the cowl to the running boards and supporting the gasoline tank.

Many other parts also are of aluminum alloy, such as the steering wheel spider, the instrument panel, crankcase, transmission case, brake shoes, floor boards, step plates for the running board, accelerator pedals and head lamps. A number of smaller parts, such as throttle levers and minor connecting links of the spark and throttle control, also are of aluminum. In the engine proper, the entire lower half of the crank case, main bearing caps, connecting rods, pistons and many accessory parts of the carbureter, ignition, water pump, starter and generator are of aluminum alloy.

These various parts, all acting in some individual capacity, present a problem, not only of the particular alloy, but of the process of casting and heat treatment. Three processes are used in making aluminum alloy products: permanent mold, die casting and sand casting. The permanent mold casting is produced by pouring metal, under the sole pressure of gravity, into a cast iron mold around collapsible steel cores, in contradistinction to die casting, where the metal is forced into the mold under pressure. Selection of the best process for casting a particular part, the alloy to be used and the heat treatment is determined best by careful study of the part and the function for which it is designed. Some parts cannot be made by the permanent mold or die casting process, particularly those of intricate design.

Regenerative Furnace Principles

Their Theory and Application Discussed—Influence of Air Infiltration—Distribution of Waste Gases

BY T. J. McLOUGHLIN

IN any metallurgical operation, and especially those in the course of which a combustible gas is evolved, those factors which determine the most efficient design of heat recovery apparatus are by no means constant. To show the variation in these factors a typical open-hearth heat made with by-product coke-oven gas was chosen, and observations made at 5-minute intervals. The fuel supply varied from 95,500 cu. ft. per hr. to 53,800 cu. ft. per hr. as a minimum.

Variation in the volume of waste gases at a temperature of 2800 deg. Fahr., the temperature at which the gases should enter the regenerative chamber of a well built open-hearth furnace, varied from 3,600,000 to 4,800,000 cu. ft. per hr., although one peak ran up to 6,400,000 cu. ft. per hr. This gives some idea of the changes in velocity at the entrance to checker openings of a regenerator and serves to explain some of the changes in air temperature encountered in successive cycles of regeneration.

SINCE 1913, T. J. McLoughlin has been in the employ of the Carnegie Steel Co. For 10 years he was identified with various operating departments, such as the blast furnace, the open-hearth and the rolling mill divisions. During the past five years he has been engaged in fuel and special engineering work for the company. He is a graduate of the Stevens Institute of Technology and a director of the Engineers' Society of Western Pennsylvania

Density of waste gases varied from 0.0114 to 0.0119 (at 1400 deg. Fahr.) and the mean specific heat of the waste gases while in the checkerwork (2800 to 1400 deg. Fahr.) varied from 0.230 to 0.246 B.t.u. These figures serve to illustrate the reasons for the ever-changing rate of heat transfer as well as the low rates of heat transfer in the lowest portion of the chambers.

The effect of the personal equation on the results obtained with a given regenerator is often very decided. Two successive heats of an open-hearth furnace having identical charges may be tapped 10 or 12 hours from the start. These variations in fuel supply, and the frequency of reversals, often represent the difference between the judgment of a good and an average first helper.

This is an abstract of a paper read May 24, before the American Iron and Steel Institute, at New York, and of the discussion which it evoked.

Effect of Increased Checker Depth

Since the rate of heat transfer is directly proportional to the velocity and also to the difference in temperature between the waste gases and the absorbing surface, and since increased checker depth reduces both the velocity and temperature difference, it is evident that considerable increase in depth must be made to effect slight differences in temperature of the preheated air.

However, most open-hearths depend upon the draft produced by the hot checker chamber and port uptakes to draw air through the regenerators to the furnace. By deepening the checker chambers this draft is increased and more air can be supplied to the furnace. This increased volume of air increases the rate of heat transfer and, therefore, the final temperature and also enables the operator to burn fuel at an increased rate, thus accelerating the melting down stage, and thereby increasing the rate of production per unit of time and decreasing the fuel consumption per unit of product.

Heat Balance of Furnace and Regenerator

In order to exemplify the extent to which regeneration can be carried and to show its effect, three heat balances have been made. The first is an actual balance taken on a tar-burning open-hearth furnace, which has relatively small checker chamber and a high rate of fuel consumption per ton of steel. The second shows that if the furnace is producing at the same rate, but double the waste heat being returned in preheated air, the fuel would be reduced from 2473 lb. per hr. to 1489 lb. per hr. If the fuel consumption could be maintained at the original rate, the improved regenerator performance hypothecated in the second example would increase the rate of production 66 per cent and reduce the full requirements 40 per cent. These figures are indicative of trend only, since all of this heat cannot be used with known refractories.

Air Infiltration

One of the most serious handicaps to the maintenance of high temperatures is air leakage. In an excellently working open-hearth furnace there is an average drop in temperature of 500 deg. Fahr. in the waste gases from the outgoing end of bath to the entrance to the regenerative chamber. This is due to radiation from port ends and to dilution of the hot waste gas with cold air entering the furnace system. Dilution of 30 per cent is commonly indicated by analyses of waste gases. This decreases the sensible heat nearly 20 per cent.

Effect of Insulation

Calculated heat balances of an uninsulated open-hearth regenerative chamber show the heat lost by radiation from a 13½-in. roof to be 1750 B.t.u. per sq. ft. per hr.

By increased roof thickness and proper insulation this

can be reduced to 45 per cent of the present loss. This would mean an increase of approximately 100 deg. in the temperature of the regenerated air going to the furnace.

Insulation of checker chambers has another value, the results of which are often erroneously attributed to insulation, and that is the elimination of leakage.

Use of Increased Regenerator Heating Surface

In the evolutionary development of manufacturing processes there is usually a stage at which some radical departure from accustomed methods becomes necessary. This change comes at the point where it is desired to extract the sensible heat in the waste gases below a temperature of 1400 deg. Fahr., and consists in the abandonment of natural draft for suction or pressure produced by mechanical means. The introduction of pressure and mechanical draft heighten the effect of leakage and make necessary sturdier and more carefully constructed chambers.

Mechanical draft enables the operator to deliver the proper volume of gas to the furnace at all times, and to remove the spent gases. The loss in draft with fouled checkers is also greatly mitigated.

Since it would require almost 70,000 sq. ft. of heating surface to reduce the temperature of the waste gas from a coke-oven-gas-fired open-hearth furnace to a temperature of 500 deg. Fahr., it has been proposed to supplement the fire-brick regenerators with steel alloys which will successively withstand continued heating at temperatures up to 1500 deg. Fahr. In the use of these metallic substances to effect heat transfer by regeneration the cycle must be extremely short.

This combination of a fire-brick regenerator with a long cycle to reduce the temperature of the waste gases to 1400, combined with a metallic regenerator with a short cycle to reduce the temperature to 500 deg. Fahr., together with the necessary fans will, of course, introduce new complications in the art of making steel. It will be found impossible to use all of the waste gases on the secondary regenerator, since if all the heat above 500 deg. were returned to the furnace the resulting temperature of the flame would be above the melting point of the roof.

Distribution of Waste Gases and Air in Chambers

Studies of distribution of gas in the checkerwork, one of which is shown in the figure, indicate that faulty distribution even in a new chamber is responsible for a disappointingly low rate of heat transfer. To help correct this situation the distance from roof to top of checkerwork should decrease with increasing distance from the furnace end; an opposite change should be made in the size of the passages below the checkerwork. Thus a uniform depth of checker brick is possible in a rectangular chamber, a circumstance which produces theoretically a uniform draft at the base of each vertical opening.

In the new types of regenerators a number of wells, 1 to 2 ft. square, and from 2 to 4 ft. deep, are left at the top of the regenerator checkerwork. In the vertical side walls of these there are a number of large openings, made by leaving out a number of bricks, through which the waste gases may pass into the checkers when the top surface becomes sufficiently blocked with dust. This arrangement of wells enables the furnace operator to run for a longer period before cleaning and gives a higher temperature of air toward the end of an open-hearth furnace run.

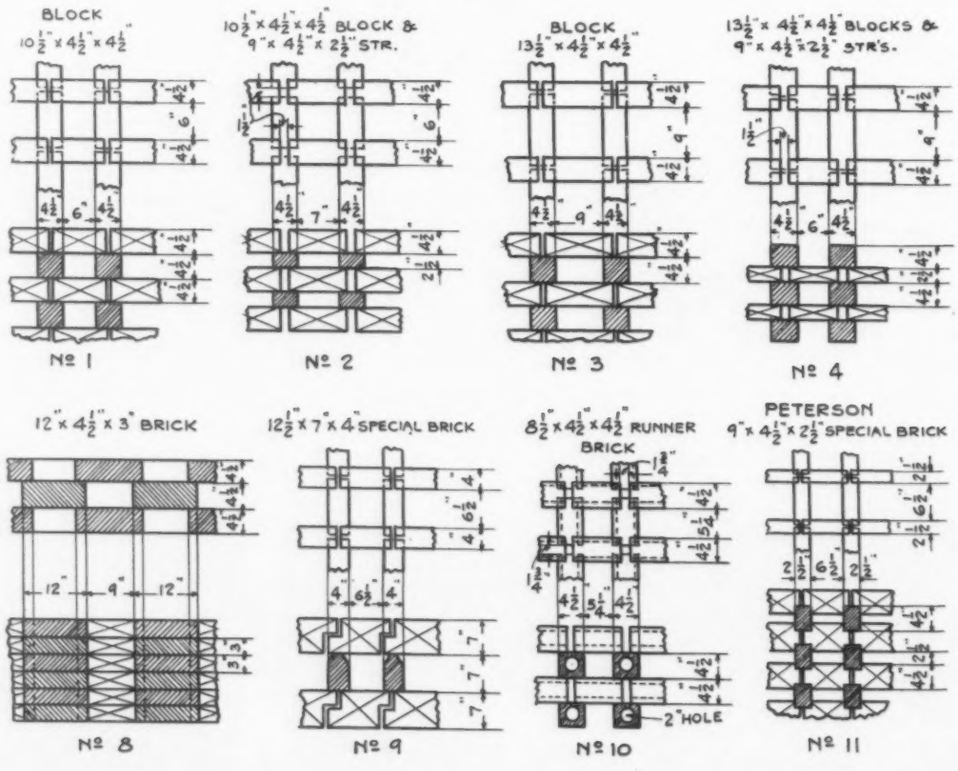
Influence of Reversal Period

In normal practice the time of reversal is left to the judgment of the furnace operator, and the cycle variation ranges from 20 min. to about 2 min. This often results in considerable unbalancing between the two ends and causes a wide variation in calorific intensity. It is not conducive to either maximum production or fuel economy. For best results a standard variation in temperature of preheated air should be chosen and reversals fixed to maintain these limits. This can be done only by fixing the temperature difference between outgoing gas and incoming air at which reversal takes place.

Metal Recuperators Favored For Old Furnaces

COMMENTING on Mr. McLoughlin's paper, M. J. Conway, fuel engineer, Lukens Steel Co., Coatesville, Pa., said that it is frequently impossible to enlarge check-

EACH type of checker brick shown in this drawing has been proposed to improve regeneration, either by changing the mass of brick in a cubic foot of space, increasing the free area per square foot of horizontal checker area, or reducing the cost of laying standard brick. Advantages depend on local conditions, such as available space, type of fuel, method of cleaning, and cost of special shapes. No one type can be equally well adapted for all conditions, in Mr. McLoughlin's opinion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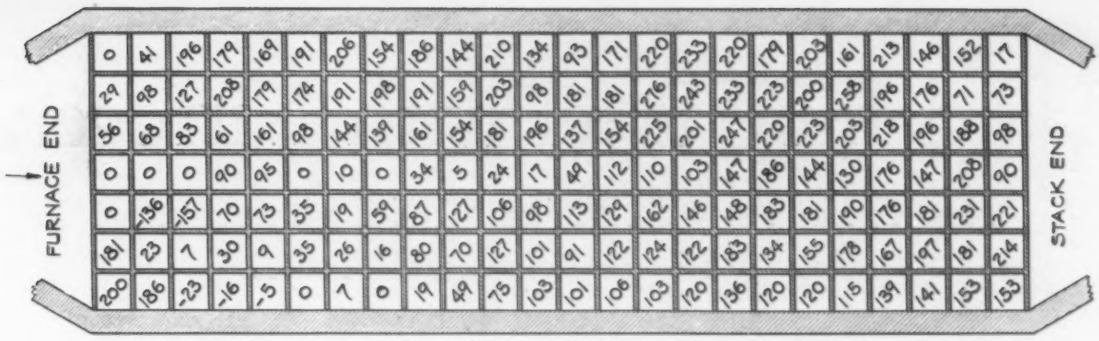
10½" x 4½" x 4½"
10½" x 4½" x 4½" BLOCK & 9" x 4½" x 2½" STR.
BLOCK
13½" x 4½" x 4½"
13½" x 4½" x 4½" BLOCKS & 9" x 4½" x 2½" STR'S.
№ 1
№ 2
№ 3
№ 4
12" x 4½" x 3" BRICK
12½" x 7" x 4" SPECIAL BRICK
8½" x 4½" x 4½" RUNNER BRICK
PETERSON
9" x 4½" x 2½" SPECIAL BRICK
2" HOLE
№ 8
№ 9
№ 10
№ 11



Velocity of Waste Gases in Each Passage of an Open-Hearth Furnace Checker Chamber

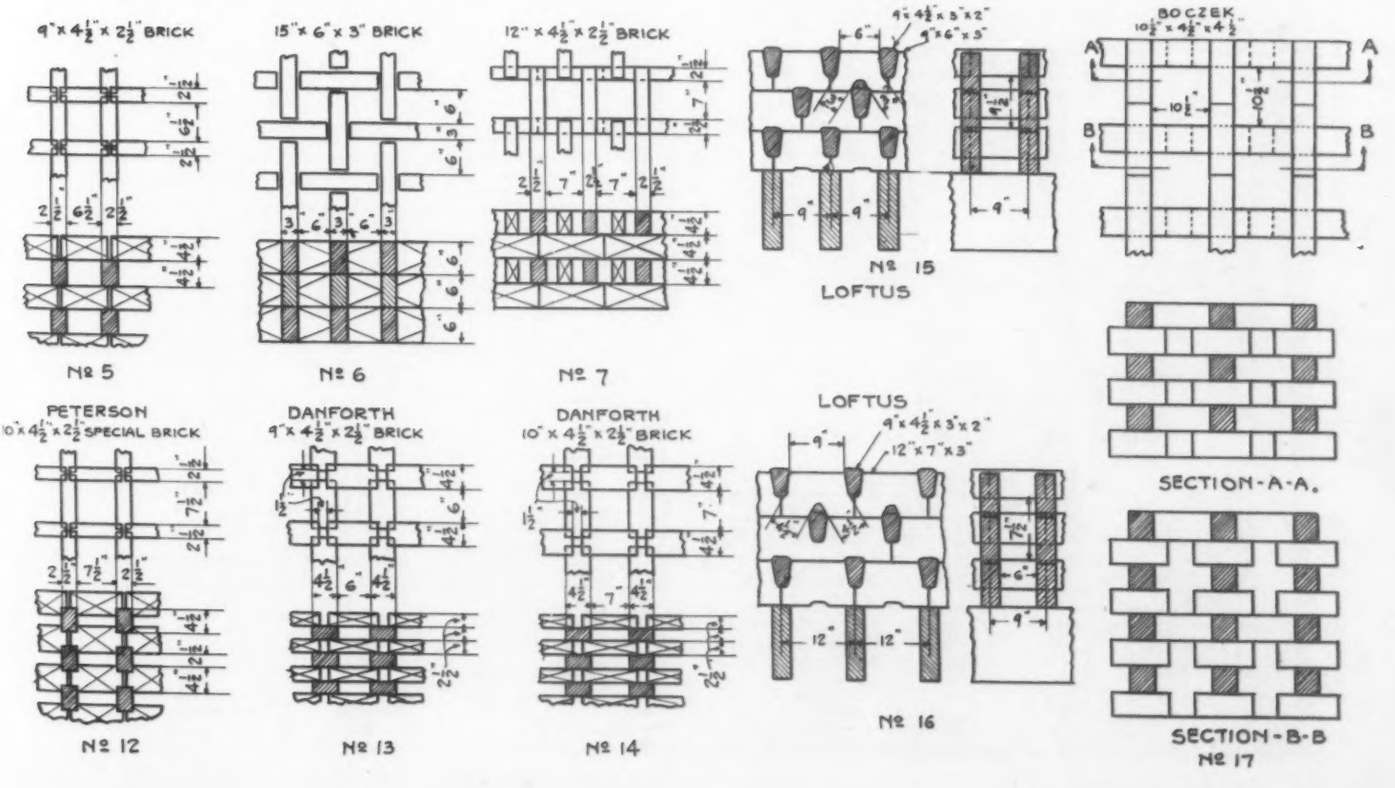
erwork in the small cellars, under existing open-hearth furnaces. A better average fuel efficiency is then possible by installing fans and by reversing the furnace by rule rather than by guess. Incoming air at constant pressure gives many theoretical and practical advantages, not least of which come from the fact that such a plan requires tight walls and insulation. If it is possible also to install recuperators made of heat resisting metal the furnace temperatures will be far more uniform, and the lag in production experienced after a campaign of say 100 heats (due to dust accumulation in passages) can be avoided in great measure.

Training Courses for Furnace Men

Mr. Conway said it is almost hopeless to attempt a mathematical treatment of checker design, for the thermal properties of the brick vary with small changes in its composition, with the quantity and nature of the adhering dust (which in turn varies with the furnace, whether acid or basic, and the type of fuel used). He also emphasized the necessity of educating the furnace men, asserting that a series of after-hours' talks on steelmaking theory and practice, and furnace construction, as illustrated by scale models, had shown immediate and gratifying results in speeding the heats and maintaining quality at the Lukens steel plant.

A. T. Miller, assistant superintendent of open-hearth department, Inland Steel Co., Indiana Harbor, Ind., said that regenerators are now usually overloaded because the capacity of the furnaces has been raised 25 to 40 per cent by increasing the hearth dimensions and putting more heat through the ports without any corresponding increase in checkerwork volume. Efficiency of the existing chambers can be improved either by reducing the amount of excess air, or by giving the incoming air a higher preheat.

Air is easiest controlled by measuring volumes at the fan, and the small excess necessary regulated by the appearance of the flame and the duration of the heat. Waste gas analyses are unsuitable for such purposes; the criterion is the necessity to refine the bath promptly. Higher preheat may be had by adequate insulation (plastic materials are favored) and by use of metallic air preheaters, similar to those used in central boiler stations. An ample factor of safety should be used in designing these recuperators, they should be made of metal which will resist 2000 deg. Fahr. successfully for long stretches of time, and with ample arrangements for frequent cleaning.



Hardening Steel with Nitrogen

How Special Alloy Steels Are Nitrided with Ammonia Gas—Details of Equipment—Analyses and Properties of Nitralloy

BY DR. V. O. HOMERBERG*

ONE of the most important metallurgical developments in recent years is the evolution of a series of new alloy steels containing aluminum, together with the method of case-hardening these steels with ammonia gas. The object is to obtain extraordinary surface hardness without producing any warping or distortion of the treated articles.

Introduction of nitrogen into steel to form one or more nitrides through the medium of ammonia gas is not new. However, the present practicability of the process is due to a thorough study of the problem by Dr. Fry of the Krupp Works in Essen, Germany, and later by a number of investigators in this country and in France.

*Assistant professor of physical metallurgy, Massachusetts Institute of Technology, and consulting metallurgist for the Ludlum Steel Co.

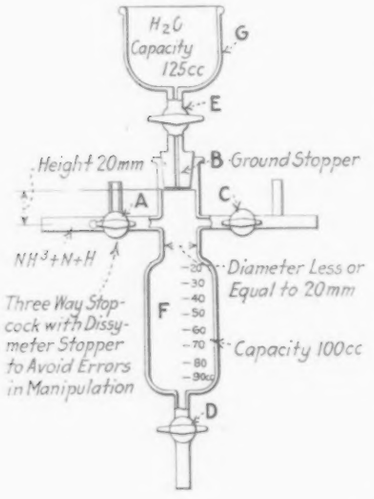


Fig. 1 — (Below) A Schematic Outline of the Apparatus Required for Hardening with Ammonia Gas

Fig. 2—(At Left) Details of the Pipette Used for Determining the Extent of the Ammonia Dissociation

Aluminum Ranks First as Nitride Base

The investigation, conducted by Dr. Fry, began with a consideration of the combining power of various alloying elements toward nitrogen and the stability of the resulting nitrides. He found that aluminum ranked first, both as to the amount of nitrogen with which it combined as well as the stability of the aluminum nitride formed. This compound showed no loss in nitrogen even when heated at 1832 deg. Fahr. Other elements which formed nitrides with high nitrogen contents include molybdenum, manganese, chromium, vanadium, titanium and tungsten in the order named.

Plain carbon steels, various alloy steels, including those containing aluminum and aluminum together with various other elements such as chromium and molybdenum, were subjected to the action of ammonia gas under definite conditions and the resulting surface hardness was determined in each instance. The outcome of this investigation was the manufacture of a series of alloy steels containing varying amounts of carbon, together

Table I.—Analyses of Three Types of Nitralloy Steels

Nitralloy	"G"	"H"	"I"
Carbon	0.36	0.23	0.16
Manganese	0.51	0.51	0.55
Silicon	0.27	0.20	0.46
Aluminum	1.23	1.20	0.88
Chromium	1.49	1.58	1.70
Nickel	0.48	0.57	0.53
Molybdenum	0.18	0.20	0.21
Sulphur	0.010	0.011	0.010
Phosphorus	0.013	0.011	0.018

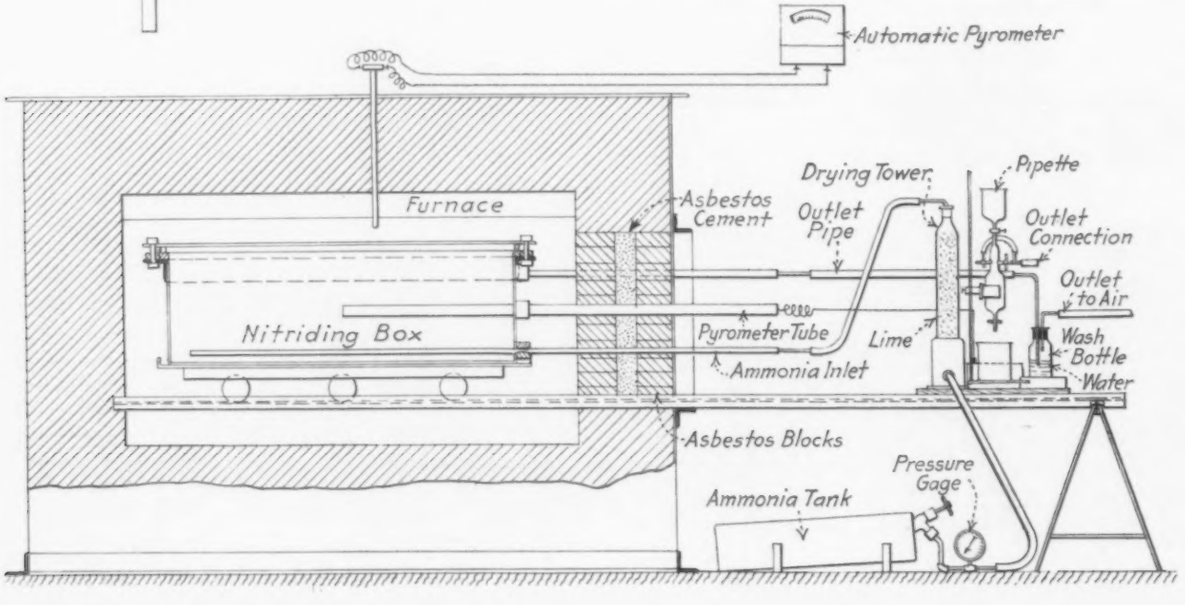


Fig. 3—Back of the Electric Furnace and the Tank Connection. The pipette is shown (below) in the background

Fig. 4—Box for Holding the Articles of Steel to Be Nitrided and the Positions of the Inlet and Outlet Tubes (Above)

Fig. 5—How the Box Is Placed in the Electric Furnace (At Left)

with approximately 1 to 1.25 per cent aluminum, 1.5 per cent chromium and 0.20 per cent molybdenum. Alloy steels having this particular combination of alloying elements were chosen because they showed the maximum surface hardness when exposed to ammonia gas under definite conditions. Furthermore, this hardness was retained at elevated temperatures and the specimens showed a marked resistance to atmospheric, water and salt water corrosion. These steels are marketed under the name of "Nitralloy,"† the different ranges of carbon content being designated as grades "G," "H," etc.

The process of case-hardening these steels with ammonia gas at the low temperatures designated by Dr. Fry is termed "nitriding." The temperatures used generally range from 900 to 1000 deg. Fahr., 950 deg. being the most common. Table I gives the analyses and Table II the physical properties of three of the Nitralloy steels after proper heat treatment and before nitriding. The presence of molybdenum tends to toughen both the core and the case resulting from the ammonia treatment. Particular attention is called to the high impact values which indicates that these steels have high shock-resisting properties.

Heat Treating Done Before Nitriding

The Fry process for case-hardening with ammonia offers many decided advantages in that all of the heat treating of the articles is done before the nitriding and no further treatment is necessary after their exposure to the ammonia gas. The temperature used is so low that no appreciable warping or distortion will take place pro-

†The Ludlum Steel Co. is the licensee in this country for the manufacture of these steels and for the process of case-hardening with ammonia as specified in the Fry patent.

vided all of the strains produced in machining and in hardening have been removed.

Articles to be case-hardened should be machined and then heat-treated to give the desired physical properties for the core. All traces of decarburization and all strains must be eliminated before the subjection of the articles to the ammonia treatment.

Special Type of Furnace Needed

Equipment required for the case-hardening of articles with ammonia consists of a suitable furnace provided with automatic temperature control, an air-tight container, which should be made of a material such as chrome-iron, for holding the articles to be nitrided, a tank of ammonia provided with a suitable needle valve for controlling the flow of the gas and finally, a special pipette for determining the extent of the ammonia dissociation.

Fig. 1 gives a schematic outline of the required apparatus. The tank of ammonia must be placed in a position such that the bent tube inside of the tank has its open end in the gaseous atmosphere and does not dip into the liquid ammonia. A suitable needle valve together with a pressure gage insures the control of a steady and even flow of the gas. Although anhydrous ammonia is a commercial product, the final traces of water can be removed, if so desired, by passing the gas through a tower containing lime.

Inlet and the outlet tubes are made of nickel and the articles in the box are supported on nickel gauze. The inlet tube extends along the bottom of the box to the back while the outlet tube is at the front and near the top of the box. Pyrometers are inserted into both the container and the furnace. The gas mixture from the container passes through a wash bottle to indicate the back pressure, which should be about ½ in., as well as the rate of flow of the gas, and finally passes into the atmosphere or is washed into the drain in the sink by means of a suitable baffle.

Ammonia gas decomposes to a certain extent into nitrogen and hydrogen. The nitrogen, which is very active at the moment of the decomposition of the gas, undoubtedly combines to a certain extent with the alloying elements in the steel to form nitrides. These nitrides, which are in solid solution or in a fine state of dispersion in the case, impart extreme hardness to the surface of the steel, a hardness which gradually decreases inwardly until it corresponds to that of the core.

The gas mixture leaving the furnace consists of hydrogen, nitrogen and undissociated ammonia. The ammonia gas is very soluble in water whereas the hydrogen and the nitrogen are insoluble. Advantage is taken of this fact in the determination of the extent of the ammonia dissociation during the nitriding operation. The special pipette is used for making this determination.

Table II.—Physical Properties of Three Nitralloy Steels

Grade "G," Previously Oil-Quenched from 1650 deg. Fahr.

Drawing Temp., Deg. Fahr.	Yield Point	Maximum Strength	Elong. in 2 In.	Red. of Area	Charpy Ft. Lb.	Brinell Hardness
800	180,000	224,500	11.0	36.0	12.0	445
900	165,000	206,300	11.5	37.5	15.0	415
1000	158,500	182,500	15.0	50.0	22.0	363
1100	137,500	156,000	16.5	57.0	35.2	330
1200	120,000	138,000	20.0	60.0	44.0	285
1300	103,300	121,000	23.0	62.5	55.3	226
1400	80,500	104,300	28.0	59.0	54.5	200
Annealed	69,000	95,000	30.0	67.5	31.6	186

Grade "H," Previously Oil-Quenched from 1750 deg. Fahr.

Drawing Temp., Deg. Fahr.	Yield Point	Maximum Strength	Elong. in 2 In.	Red. of Area	Charpy Ft. Lb.	Brinell Hardness
800	156,300	178,800	12.0	47.0	20.6	400
900	143,500	170,000	16.0	49.0	25.5	365
1000	133,300	160,000	17.0	54.0	30.1	340
1100	117,500	134,500	18.0	61.0	48.1	290
1200	103,800	122,000	21.5	67.0	59.2	255
1300	85,500	102,500	27.0	72.0	69.0	228
1400	75,000	90,500	32.0	73.0	73.0	190
Annealed	60,000	80,000	34.0	70.5	47.8	157

Grade "I," Previously Oil-Quenched from 1750 deg. Fahr.

Drawing Temp., Deg. Fahr.	Yield Point	Maximum Strength	Elong. in 2 In.	Red. of Area	Charpy Ft. Lb.	Brinell Hardness
800	133,750	159,500	15.5	60.3	36.0	336
900	127,500	154,750	16.8	58.2	39.1	331
1000	126,500	148,000	16.2	61.0	44.9	321
1100	112,500	126,500	18.0	66.9	60.2	285
1200	100,000	113,500	22.0	71.0	65.3	232
1300	79,500	96,750	27.3	75.0	81.5	202
1400	67,750	85,500	32.5	75.0	90.5	170
Annealed	47,750	78,250	34.5	67.1	...	134

Fig. 6—Front of the Electric Furnace with Ammonia Tank on Floor at the Side

How Ammonia Dissociation Is Found

The pipette used for determining the extent of the ammonia dissociation is shown in Fig. 2. It has a three-way stopcock at point "A" and two-way stopcocks at points "C," "D" and "E." The purpose of the three-way stopcock is to by-pass the gas mixture while a determination is being made. In order to make this determination, the gas is allowed to fill chamber "F" while "C" is closed. The chamber "G" is filled with water. Stopcock "D" is closed and then the gas is by-passed by means of stopcock "A." The chamber "F" is now filled with a mixture of hydrogen, nitrogen and undissociated ammonia. The stopcock "E" is opened whereby the water runs into the gas-filled chamber. The undissociated ammonia is absorbed immediately. The gas mixture above the water solution represents the mixture of hydrogen and nitrogen. The scale on chamber "F" reads directly in per cent of dissociation. If the water solution reaches the 30 per cent mark, then it means that 30 per cent of the ammonia has dissociated. If the reading is higher than this value, the gas flow should be increased by means of the needle valve, while if the reading is lower than 30 per cent, then the gas flow should be decreased, since 30 per cent is the desired value.

Figs. 3, 4, 5 and 6 show different views of a commercial installation. Fig. 3 shows the back of the furnace together with the tank connection and the pipette.

Fig. 4 shows the box for holding the articles to be nitrided and the positions of the inlet and outlet tubes. It will be noted that the cover is bolted to the flange of the box and is kept tight by employing a suitable gasket. Asbestos washers, or asbestos packing, are generally used as a seal. It is best to cover the asbestos with aluminum foil in order to prevent any moisture from entering the container through the asbestos packing. Merton (*Fuels and Furnaces*, Vol. 6, No. 10, page 1371) uses nickel wire as a seal and employs clamps with suitable wedges for making the container air-tight.

Fig. 5 shows the manner of placing the box in the furnace. It is to be noted that the furnace is provided with rollers which should extend in front of the furnace to facilitate the withdrawal of the box for charging. Fig. 6 shows the front of the furnace.

The time of exposure of the articles to the action of the ammonia gas at the nitriding temperature varies from 2 to 90 hr., depending on the service to which the articles are to be subjected. No heat treatment is given to the parts after nitriding, the articles being cooled in the box, generally to room temperature. It is often convenient to shut off the ammonia after the nitriding operation, and to short circuit the inlet and outlet tubes by means of a short piece of rubber tubing after which the box can be withdrawn from the furnace. The ammonia is then re-connected and the box allowed to cool for two to three hours after which the ammonia is shut off and the box opened and recharged. The articles, after their removal from the box, can be placed directly into service or given a final finish by lapping or by some other suitable means.

(To be concluded)

Materials Handling for Sheet Metals

Management, Layout and Handling Problems Discussed—General Survey of the Character of Control in Manufacturing Plants

MAKING a general survey of the question of management layout and materials handling in manufacturing processes, John Carmody, editor of *Factory and Industrial Management*, Chicago, gave utterance to some decidedly pungent remarks at the recent Detroit meeting of the Materials Handling Division of the American Society of Mechanical Engineers. He said, among other things, that many men in industry are still using 1904 ideas, and some of them go as far back as 1892. The dates were fixed partly by the fact that it was in 1904 that Mr. Ford ran his first "horseless wagon" down the streets of Detroit.

Supply of materials to men operating machines formerly was in large lots, and frequently they consisted of a quantity, estimated as that required for a day's work. Contrasted with this is the present idea that the man requires only the piece he is working on, and the next piece conveniently at his elbow when the first is finished.

Each Can Learn From the Others

Mr. Carmody scouted the idea that one line of business cannot learn from others. He stated that the continuous sheet rolling process of the American Rolling Mill Co. came from the continuous paper-making process and was developed by the same engineers.

More than 70 per cent of the 500,000,000 tons of coal produced annually in the United States is loaded into cars by hand. This is in spite of the many conveyor tests which have been made in an effort to substitute machinery for hand labor for this work. Inertia, according to the speaker, is the normal state of mind in American industry.

Inertia Hampering Progress

An example of this occurs in the methods of the United States Treasury Department, with regard to obsolescence allowances on income tax returns of corporations. The Treasury is said to insist on a period of 20 years for this procedure, regardless of the facts of the case, and thus, according to Mr. Carmody, is discriminating against progress. This he referred to as an 1892 idea of the Treasury Department, for much equipment in rapidly changing industries or processes should be written off in from 12 to 24 months, instead of that number of years.

In a brief discussion on this paper, R. L. Lockwood of the Department of Commerce said that there is under consideration a materials handling division for the Department of Commerce. This, he believes, will be an actuality shortly. Much has been done along this line by the department as an aid to industry in the past few years, but it has been confined mostly to standardization, facilitating interchangeability. The speaker referred to the fact that both President Hoover and Secretary Lamont, being engineers themselves, realize the vital importance to industry of this great aid. Consequently, both are wholeheartedly in favor of carrying forward such of the work as was outlined.

Operation of the Sheet Metal Shop

BECAUSE two papers tentatively arranged for by the Detroit committee could not finally be obtained, a pinch-hitter was brought into play, and acquitted himself most creditably in the short space of time at his disposal. George E. Hagemann of the *American Machinist* went to Detroit two or three days in advance of the meeting, made a quick inspection of two or three plants, and prepared his papers. By a freak of fate, Mr. Hagemann had, because of this condition, to prepare two separate papers, both coming on somewhat the same general topic. One covered the operations of the sheet metal shop as such, while the other took up automotive body building.

Supplies for at Least 4 Hr. of Work

Discussing the question of management relating to supply of materials, Mr. Hagemann brought out the point that, in a large number of cases, material for about 4 hr. of operation seems to be the minimum "cushion," so to speak, between the running of a sheet metal plant in the automotive industry and its forced stoppage for want of supplies. In the body-building plants a week appears to be the maximum allowance for this matter. As a consequence, the manufacturers are largely using the railroad trains as storerooms.

This conserves floor space for the vital manufacturing operations, and, as much of the material is handled directly from railroad cars into conveyors feeding production lines, it results in an actual decrease in the operations of handling materials. It cuts out the necessity for taking them off the cars, putting them into temporary stock or

storerooms and then getting them out again for productive purposes.

Use of mechanical means for handling all materials was strongly advocated by the speaker. He cited the experience of one company which cut its cost of handling sheet steel by 40 per cent through the use of mechanical means. At the same time, it reduced materially the number of accidents which had previously been experienced.

Taking up the handling of raw stock, placing materials into presses and taking them away, baling scrap and otherwise handling it, etc., the speaker referred to the many types of equipment used for this purpose, including slat conveyors, overhead traveling chains, skid racks in conjunction with electric or gasoline trucks and the overhead traveling crane for certain purposes.

Scrap Difficult to Handle

In discussing this paper, N. H. Preble of Materials Handling, Inc., Detroit, spoke of the scrap problem as being one of the most difficult to take care of. Baled scrap is not always handled by means of a crane, because of the time element. There may be a bale a minute and this must be loaded at once into gondola cars to avoid accumulations. In such cases a continuous conveyor is practically a necessity. Getting the scrap to the baler is another problem. This is done usually by boxes or crates on electric trucks, or by means of a conveyor in the floor. The latter is preferably of the steel apron type.

There is a tendency all through the body shop to go to larger and larger presses. This complicates very materially the layout for handling.

Paper Wrapping of Sheets

Incoming materials, such as body sheets, are being handled mainly in gondola cars. Damage to the material from operation of the elements is avoided through handling the sheets in heavy waterproof paper. This paper is not removed until after the sheets have been lifted out of the car by an overhead crane and run into storage. Then the bundle is broken and the sheets proceed, as needed, to the manufacturing line.

Automobile Body Building

OPERATIONS in a body building plant come under three main classes, easily grouped on separate floors, according to Mr. Hagemann. These three classes are:

1—Sub-assembly,
2—Assembly of body,
3—Cleaning and painting.

Layout is strictly in accordance with the sequence of operations. In a sense this is a continuous-process industry working from parts. The bodies may be grouped in three classes, including those (1) with frames largely of wood; (2) frame and inclosing members steel, with the joints riveted; (3) steel, with joints welded.

Machines are so located that a part (in the wood-frame body, for example) passes directly from the first operation into the machine for the second, thence to the third, etc. For this reason there is next to no handling equipment needed. Sub-assemblies are made on jigs, the material then, on trucks or other conveyors, going into assembly lines for completion.

Cloth for upholstery is cut, many layers thick, by knives following markings from templets. Steel jigs and fixtures are to be preferred, where available.

Schedules usually are made out for a month ahead, and materials are ordered to suit. Synchronism is sought between the parts arriving and the assembly of the particular body under way. As there are many types of bodies called for, and many colors, careful production control is essential.

Adequate inventory control is another necessary element, for minimum stocks of materials must be carried if cost is to be low. In one case, bodies are scheduled for completion 4 hr. ahead of the chassis assembly line. To maintain the final synchronism an interlocking conveyor system is required, with feeders meeting the assembly line and carrying parts or sub-assemblies as needed.

Magnesium Alloys Meet Strong Competition

In a letter to *Engineering and Mining Journal* (June 1), S. K. Colby, president American Magnesium Corporation, Pittsburgh, says that the use of magnesium and its alloys is increasing in America at a much slower rate than in Europe because of sharp competition of other materials and because potential users have not yet been shown that the increase of cost is justifiable.

Of the 366,400 lb. domestically consumed in 1927 and 865,662 lb. actually sold in 1928, less than 15 per cent was marketed as fabricated shapes or alloys. The remainder was used as a deoxidizer or desulphurizer in other metals and as a minor addition in aluminum heat-treated alloys. No corresponding figures are available for the European consumption, but it is likely that more than 90 per cent of the 5,000,000 lb. produced is represented by fabricated metal.

The best heat-treated aluminum alloys in sheet or forgings will have 60,000 to 63,000 lb. per sq. in. tensile strength with 18-25 per cent elongation. The best average result possible with magnesium base alloys is about 42,000 tensile with 10 per cent elongation. The difference in weight is as 1.74 to 2.70, or a saving of about 33⅓ per cent. This saving in weight for equal sections is practically balanced by the difference in strength. Under these circumstances there is little urge to pay a premium for wrought magnesium.

With castings the comparison is slightly better. Heat-treated magnesium castings are about on a parity as to strength and elongation with the average heat-treated aluminum castings. Eliminating the lower proportional limit due to the different moduli of elasticity, a field for magnesium castings exists, in aircraft motors and accessories where weight saving is so essential. This field as been vigorously tilled, with the trebling of consumption in a year, but this means a rate of only fifteen to twenty tons annually.

Commercial, and not technical, conditions are the limiting factor. Costs essential to the production of magnesium base alloys in marketable form are high. Losses in melting are greater than with aluminum, and in subsequent fabricating operations cold work hardens magnesium much more rapidly, making more frequent annealing necessary. The lightness of the metal requires more and larger gates and risers in casting, which again is translated into additional costs.

Still more important are the different conditions abroad. With automotive vehicles, taxes and high cost of gas and oil put a premium on lightness. In Germany, magnesium-alloy wheels have been extensively used on trucks. The castings sell in quantity at 80c. per pound. Corresponding aluminum castings sell for 35 to 40c. per pound. Allowing for the difference in weight of one-third, magnesium castings are purchased at substantially a premium of 25c. per pound. No such condition exists in America to force automotive manufacturers to the lightest weights.

In France, forged or hot-pressed pistons of pure magnesium have been largely sold for government aircraft motor development at a considerably higher price than the corresponding aluminum.

Large Open-Hearth Steel Furnaces

Progressive Development of Huge Units Shows No Present Limitation—Improved Yield at Lower Cost Reported

BY FRANK A. KING

THROUGHOUT the history of the modern iron and steel industry the question of the size and capacity of the open-hearth furnace has been important. As compared with the increase in size of blast furnaces on the one hand and the blooming mill on the other, the problem of open-hearth development has been second to none; and there has been relatively less time for its solution.

Coincident with the need for greater open-hearth tonnage came the change from acid to basic bottoms. It is only 60 years since the first open-hearth furnace was built, in England. For the first 20 years acid bottoms only were used. The change from acid to basic practice in the United States took place largely in 1890-1900; therefore, the real development of open-hearth production has taken place within the last 25 years.

At the beginning of this century 50-ton furnaces were considered large and much doubt was entertained as to whether tonnages of such size could be produced with proper maintenance of quality. Indeed, throughout the entire record of open-hearth expansion, apprehension has been the stumbling block of progress.

Depth and consistency of the slag blanket, with its vital functions of deoxidation and elimination of impurities, has occasioned much critical study. The fear also of excessive chilling in larger and larger ladlefuls and the dread of ferrostatic pressure have demanded caution and contributed to pessimistic doubt. However, in spite of the dread and caution inspired by these bogies, open-hearth steel production has steadily progressed in establishing larger furnaces and their auxiliary equipment.

This is an abstract of a paper read May 24, before the American Iron and Steel Institute, at New York, and of the discussion which it elicited.

Perhaps the more important advance in the development of open-hearth capacity has been in furnaces installed during the last few years. Among these the progressive installation of the open-hearth plant of the Weirton Steel Co. has been representative. The plant includes 12 stationary furnaces of from 150 to 350 tons capacity. Building and plans for seven furnaces were originally started. The first heats, poured in November, 1920, were approximately 105 tons, but were rapidly increased to about 130 tons. Later all seven furnaces were increased to 150 tons.

Three more furnaces (Nos. 8, 9 and 10), erected and placed in operation in 1927, were made of 250 tons. At this time No. 7 furnace was rebuilt for 250 tons. Late in 1927 construction was started on No. 11 furnace, of 300 tons. The first heat was cast on Feb. 4, 1928. The last and largest unit is No. 12 furnace, of 350 tons capacity.

These furnaces (Nos. 11 and 12) are the largest stationary furnaces yet built. Experience obtained at Weirton from their operation shows increasing economic efficiency and quality progress. The hearth dimensions are approximately as follows:

Furnaces	Tapping, Tons	Bath Length, Ft.	Bath Breadth, Ft.	Hearth Area, Sq. Ft.
Nos. 1 to 6.....	150	40	16	615
7 to 10.....	250	45	17	720
11	300	49	19	860
12	350	55	19	992

Our experience indicates a tendency to increased yield in the product of the larger furnaces. Besides being an item of economy, this indirectly supports the subject of quality, for our experience also demonstrates that oxida-

BORN near Cleveland, Frank A. King entered the employ of the Otis Steel Co. in 1900. The basic open-hearth process was then in the early stages of development, the Otis company being among the first to adopt it, and Mr. King since then has devoted himself to open-hearth operations. After three years with the Otis company and a few months at the Clairton steel plant, he became identified with the Colorado Fuel & Iron Co., at Pueblo. In 1910 he went to the Ohio works of the Carnegie Steel Co. at Youngstown as foreman melter and in 1913 he assumed a like position for the Youngstown Sheet & Tube Co. Since 1920 he has been in charge of the new open-hearth department of the Weirton Steel Co., at Weirton, W. Va.

tion in the deeper bath is not quite so extensive as in the shallower.

Less bottom trouble has been found as the size or depth of bath increases. With the deeper bath the bottom cleans better and is more easily kept in proper condition, and in practice the larger furnaces have given less bottom trouble.

As the size of the furnace increases charging naturally assumes greater and greater importance. This may be the limiting point of larger furnaces before we reach the limit of size due to metallurgical operations on the one hand or structural limitations on the other.

There is no question that there is a limit to the size of open-hearth furnaces, as there is to blast furnaces. But we believe from our experience with large open-hearth furnaces that we have not approached the limit in size. To keep pace with the modern trend of all industries, furnaces will be built even larger than our 350-ton furnace, which is the largest stationary open-hearth furnace in operation or projected.

Suggested Larger Furnaces with Present Ladles and Cranes

ALONG with the progressive expansion in the size of furnaces there has been a coincident expansion in the size of charging boxes, ladle cranes and all the other auxiliaries through the use of which the furnaces produce their steel, said George L. Danforth, assistant general superintendent, South works, Illinois Steel Co., in discussing Mr. King's paper. This in itself has made for a smaller number of men for each ton of steel made.

A further factor in economy in the large furnace has been that the amount of brick used has been less for each ton of steel, because the thickness of the walls has not increased in proportion as the furnaces have grown larger. Several such factors have conspired to make the cost of producing steel in large furnaces considerably less on the unit basis than that in smaller furnaces.

The quality of the product appears to be in every way equal, in steel from the large furnaces, to that obtained in the smaller, earlier types. This factor, together with the greater economy of the big units, has practically put a stop to the further installation of small furnaces, except for use in steel foundries and the like.

Design has been given a better send-off in connection with the large furnaces. Each component part is made of the best design which the engineers have been able to evolve, and these parts have been worked into a harmonious whole, far better suited to its use than was formerly the case.

In operation there is a better direction to the flame and at a higher temperature than formerly. This results in better control over the furnace reactions. Formerly 7 or 8 sq. ft. of hearth area was required for a ton of capacity in the furnace. This has now been reduced to an average of perhaps 6 sq. ft. and one new furnace figures out at only 4.9 sq. ft. Along with these figures we have the former 12 tons of steel an hour for each 1000 sq. ft. of bath area, compared with 15 or 16 tons on the average in the newer furnaces and with 17.9 sq. ft. for the particular furnace above mentioned.

Similarly, the coal consumption has been improved from around 600 lb. to each ton of ingots to 500 lb. or less, and on the new furnace specifically cited, only 418 lb. As this furnace has waste-heat boilers, giving a quantity of steam equivalent to the consumption of 144 lb. net of coal for each ton of ingots, the actual current consumption chargeable against ingot production on that furnace is only 274 lb. to the ton.

While maintenance costs and fuel costs are thus less on the ingot tonnage basis than in the smaller furnaces, the larger furnaces have certain disabilities. They deliver ingots to the soaking pits more intermittently and in much larger tonnages at a time. This results in requiring a greater soaking pit capacity.

It may be said, however, that certain changes not heretofore apparent may readily be made in existing open-hearth plants. They have ladles and cranes designed for their present unit furnace capacities, or perhaps for smaller, earlier capacities, but used for those now obtaining. These are operating satisfactorily at tonnages now made, but would not be adaptable to much larger tonnages coming from an increase in the size of the furnaces.

However, by using the double-heat method—that is, tapping the steel from a large furnace into two ladles, such as was described by Mr. King for his largest furnaces—these plants could utilize their present ladle and crane capacity and at the same time achieve the greater economies of production obtainable from the larger furnaces. Thus, an expansion in output accompanied by lower unit costs might be made with a conjunction of double-size furnaces and the present auxiliary equipment.

Study Changes That Occur in Stock Column of Blast Furnace

RESULTS of another step taken by the United States Bureau of Mines, in its investigations of blast furnace operation, are given in Technical Paper 442, by S. P. Kinney, just published. Samples of the gas and stock in a 700-ton furnace, data on the rate of descent of stock, measurements of temperature, and data on the volume and velocity of the gas were taken through holes in the shell and lining of the furnace at certain planes or elevations. An attempt was made to follow the steps in reduction of the charge during its descent in the shaft.

The data collected in the shaft of the furnace were obtained from four planes above the mantle. A series of sets of gas samples, temperature, and static and velocity pressure observations was taken on each plane.

As a result of this and other similar studies, methods have been developed for the measurement of velocities of gas, temperatures, pressures and composition of gas across a series of planes at any elevation between the inwall and center of the blast furnace. The combined data from these observations afford an insight into various factors, such as the amount of gas flowing, the temperature, the pressure, the composition of gas and the rate of flow of gas, and some information in regard to the rate of flow of stock. With these data at hand the progress made in each step in the process of reduction, with descent of stock in the shaft, may be followed.

The effect of any change in bell, stock lines, bosh or hearth diameter, wall batter or hearth may be directly traced in the resultant changes in gas composition, temperature, pressure and velocity, if the data are procured before and after the changes are made.

As to the conditions existing on each plane, it has been shown that the rate of gas and stock flow is not uniform across any plane parallel to the hearth. It is probable that the flow of stock in the vicinity of the inwall is more rapid than at the center of the column.

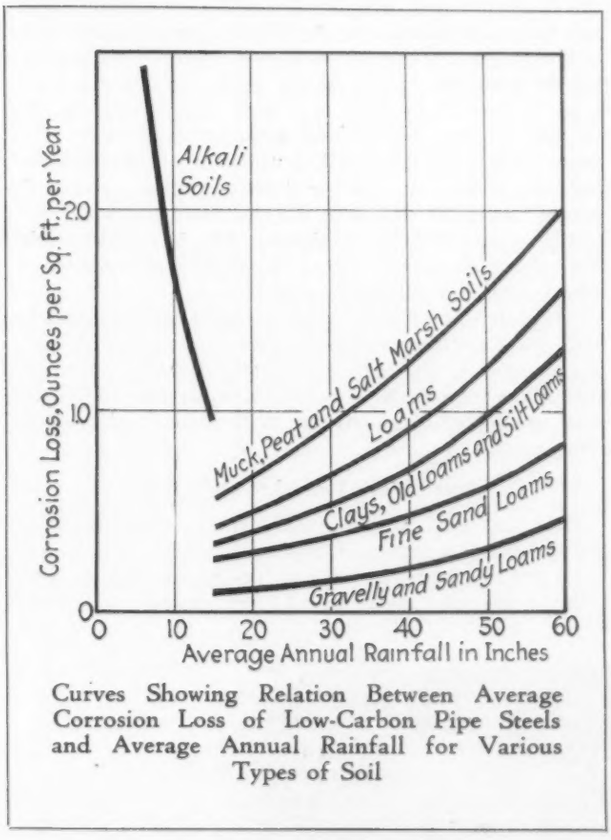
Significant information was obtained as to the variation in velocity of gas, the carbon monoxide; carbon dioxide ratio, and the removal of oxygen above the tuyères. This paper may be obtained from the superintendent of documents, Government Printing Office, Washington, at a price of 30c.

Pipe Steel Resists Corrosion Poorly

Soil Corrosion Studies Show That Commercial Steels Rust at Nearly Equal Rates—Main Reliance Should Be Placed on Bituminous Coating

CORROSION of pipe buried in the ground has long been under discussion and investigation by commercial interests. It represents an economic loss impossible to calculate, but undoubtedly is enormously expensive. Replacements involve much more than the cost of the new metal—the excavation, pipe laying, backfill and surface replacement each involves equally large sums, to say nothing of the losses from leaks endured before replacement was forced.

In a paper read before the recent soil corrosion conference at the Bureau of Standards and written by T. McLean Jasper and George Koresh, respectively director of research and research engineer of the A. O. Smith Corporation, Milwaukee, a mass of test data accumulated by the Bureau of Standards since 1922 is correlated and discussed. In these tests 16 different pipes were buried in each of 47 different localities selected to give the widest variety of soil and moisture conditions. The pipe was made of wrought iron, open hearth steel, Bessemer steel, copper-bearing steel, and commercially pure iron. While there is a noticeable lack of consistency in the corrosion losses in the various soils, when the average losses for each class of metal are compared, there is only a difference of 12.7 per cent between the least corrodible (commercially pure iron) and most corrodible varieties (wrought iron). The authors therefore attempted with more success to correlate the corrosion of pipe with the variety of soil and the average rainfall.



Curves Showing Relation Between Average Corrosion Loss of Low-Carbon Pipe Steels and Average Annual Rainfall for Various Types of Soil

The accompanying curves summarize the results and are thought to represent fairly well the composite effect of all the variables on the trend of corrosion. The curve for clays is the most accurate in shape, because the greatest number of values were available for plotting and no extrapolation was necessary.

It is concluded by the authors that the amount and quality of the outer coating on a buried pipe is of more importance than the nature of the metal in the pipe wall, and that the corrosion-resisting coatings applied to pipe laid, for instance, in wet marshy soil should be much more effective than when the pipe line reaches an area of gravelly loam. If adequate protection cannot be given, it would be proper to make a long pipe line having varying thickness depending upon the soil characteristics through which it passes, so the entire line would have the same life before it was rendered useless by corrosion. However, "it has been clearly demonstrated that steel is not the most economical material to use to resist corrosion." Asphalt or coal-tar protective coatings are far more economical, if properly applied.

Pipe used in the test had the original mill-scale present. Analysis of the Bureau of Standard's tests show that a heavy scale is accompanied by a low average loss, but also produces the deepest pits. The latter determine leakage. Consequently the authors hold that it is good practice to remove scale from pipe, and thus produce a uniform corrosion, even though at a greater average rate. Pitting under a good protective coating has been noted on pipe which had not properly been de-scaled and dried.

In order to carry oil and gas at higher pressure, the large diameter trunk pipe lines are now being made of stronger steel higher in carbon (and sometimes higher in manganese or copper) than the standard lap-welded pipe of small diameter tested by the Bureau of Standards. Long-time data on the higher carbon materials (carbon 0.22 per cent) are not available, but immersion tests in laboratory solutions approximating ground water show that they are considerably more resistant than the usual pipe steel (carbon 0.08 per cent). The authors believe this to be associated with the fact that steels containing less than 0.12 per cent carbon furnished the A. O. Smith Corporation in large tonnages carry one-third more sulphur and phosphorus than the steels containing between 0.20 and 0.30 per cent. "It is not believed that sulphur and phosphorus are necessarily responsible for the greater corrosion rates, but it is believed that the degree of freedom from these constituents indicates the average cleanliness of these two grades of steel, and that clean steel will corrode less rapidly than dirty steel, other things being equal."

"Advertising of alloys of iron with a dash of this or that and a cryptic name should be viewed with suspicion until satisfactory tests under specific conditions of service are obtained," said F. N. Speller, before the American Association for the Advancement of Science, Dec. 28, 1928. "So far no low-priced iron alloy has been marketed that seems worth the difference in cost except for atmospheric exposure, and ordinary Bessemer steel with a little copper seems to be as durable as any other."

Makes a Light Trussed Joist

Kalman Steel Co. at Buffalo Slits Small I-Beams— Unusual Mill Drive Employs No Pinion Stands

A CONTINUOUS rolling mill has recently been put into operation by the Kalman Steel Co. of Chicago at its Buffalo plant, that is interesting from several standpoints. The mill is used to slit small I-sections in a hot state to produce a light trussed joist for building construction. It was specially designed and built for the service by the Farrel-Birmingham Co. of Buffalo, and consists of three stands, with accessories including an approach table, pinch rolls, delivery rolls and a run-out table. The whole is driven by a General Electric 300-hp. 440-volt, 3-phase wound-rotor induction motor with adjustable speed control.

No Pinion Stands Are Used

One of the interesting features is the method of drive, no pinion stands being included in the installation. The three work stands are driven directly through a combination of bevel and back gears, and the accessory equipment by chain and gear drives from the work rolls. The construction of the various stands is also unusual, and all roll necks and gear shafts are equipped with Timken bearings.

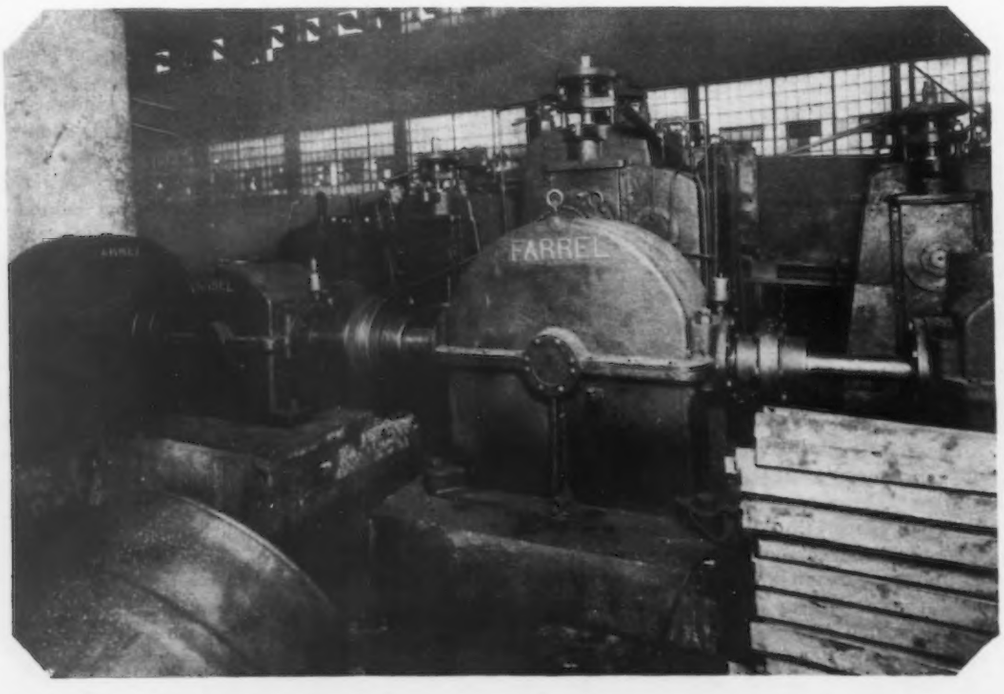
As to the stands proper, the first or entry stand pinches the beam and delivers it to the slitting rolls. The second stand operates the slitting rolls which form the strands in the finished beam, and the third stand operates the finishing rolls and delivers the joist to the hot bed. The drive of all three stands is carried from the motor through a 20-in. single reduction unit and three bevel gear units, one for each stand, all shafts being equipped with tapered roller bearings. Since the distance between the last stand and the middle, or slitting, stand varies with the size of the joist to be rolled, provision has been made for moving both the last stand and its bevel gear drive on rails. It is a simple matter to move them and relocate them in any position desired.

As to the housings, the design of all three is the same, except that the slitting housing is 50 per cent larger than the entry and delivery housings. Also, an outboard stand has been provided for the delivery housing because of the wide rolls used in it. The back gear arrangement for driving the work rolls in the stands, which has eliminated separate pinion stands and the usual spindle and wabbler construction has proved very effective in service. This construction was adopted because it is necessary to use rolls of different sizes in the stands. For example, on the slitting stand the roll sizes vary between limits of 15 in. minimum and 22.5 in. maximum. The back gear design has been worked out so that the vertical window can be used for the roll spindle bearings.

It is of interest that, while the back lash between the back gears and the roll spindle gears varies with the relative position of the back gear shafts and the roll spindle shafts, the total range of variation is between 0.010 minimum and 0.040 in. maximum; a variation which cannot cause trouble.

Some Work Rolls Are Overhung

The back gear shafts and the work roll shafts in all the stands are mounted in Timken bearings. In the case of all but the straightening and finishing stands the work rolls are overhung, being keyed to an extension of the roll



Light Trussed Joist Mill from the Drive Side. Note the absence of pinion stands

shaft which projects beyond the housing. This construction, which is one of the novel features of the mill, was adopted for several reasons, the most prominent being the added facility with which the rolls can be removed and replaced. In the case of the straightening and finishing rolls, their length makes it necessary to support them at both ends, consequently the former are equipped with outboard bearings, and the latter are carried by two bearing supports.

As to the Timken bearing mounting proper, the back gear shafts have a single bearing at each end, the bearings being mounted directly in upright members forming part of the stand frame. Access for inspection purposes is obtained through holes in the outer housing, which are normally covered by circular plates securely bolted to the housing. The roll spindles have a double bearing mounting at each end, the bearings being mounted in removable blocks of special design. The block proper consists of a solid steel casting, machined for the reception of the bearing cups, or outer races, which are pressed directly into it. The cone assemblies are then inserted, and the whole slipped on to the roll spindle as a unit, the bearings being definitely located by a shoulder on the outer block housing. This construction adds to the ease with which the rolls can be changed. Bearings are used of capacities adequate to carry the excessive thrusts caused by the overhang of the rolls. In the case of the slitting rolls, special large, double bearings are used on the end of the spindle nearest the rolls themselves.

Oil Pressure Pump Driven from Roll Shaft by a Chain

The lubrication of both gear and roll spindle bearings is accomplished by a circulating oil system, the pump supplying the pressure being driven from one of the working roll shafts by a chain. The bearing closures on the side of the stands away from the rolls are comparatively simple in the case of both the gear and roll shafts. On the roll side, closures of a somewhat more elaborate construction have been provided in order to seal the bearings against the entrance of water or scale. What water does get in is removed in the oil reclaiming and filtering apparatus that forms part of the lubricating system.

The pinch rolls and approach table at one end, and the delivery rolls and run-out table at the other are chain and sprocket driven from the shafts connecting the bevel and back gears of the entry and finishing stands respectively. In the case of the latter, which is fairly typical, a sprocket wheel is mounted on the unit-driving shaft, between the gear and the coupling. The chain runs from this sprocket over another on a shaft extending across the mill which terminates in a spur gear or pinion. This pinion forms part of a train of three, mounted vertically, the other two being on the ends of the delivery roll shaft extensions. Much the same arrangement is provided for driving the pinch rolls from the entry stand driveshaft. As a result, all parts of the mill run at any predetermined relative speed, which speeds are all functions of the driving motor speed.

Compactness and Flexibility a Feature

The whole installation is notable for its compactness and flexibility and for the high quality of the finished product. By virtue of the method of drive employed, the motion of the motor is transmitted to the rolls with so little vibration from back lash that the finished joists are free from chatter marks or waves, even at high rolling speeds or heavy rolling pressures. The fact that tapered roller bearings are used, especially on the roll spindles, also contributes to the quality of the finished product, because, since there is no wear in the bearings, the roll settings are permanent in character, and the gage of the product is uniform. The bearings also reduce the power demand of the mill materially; in fact the friction loads of the stands are so low that any one of them can be turned over by hand from the driving coupling.

Uses and Properties of Blast Furnace Slag

A great amount of information about the use of blast furnace slag has been collected by the National Slag Association, 937 Leader Building, Cleveland. Engineering and technical literature has been carefully searched, the statements found therein summarized, and the material gathered into main headings, each of which forms the subject of a sizable pamphlet. Seventeen of these "symposiums" have been published, most of them having to do with the properties of concrete made with slag aggregate, such as its permanence, workability, wear resistance, absorption, bond, and heat resistance. Other pamphlets contain material on the preparation of slag for market, its use as ballast, and for water bound or bituminous macadam.

Mill from the Working Side, Showing the Overhung Roll Construction. Rolls are keyed to an extension of the roll shaft

Fatigue Limit of Steel Found by Rapid Electrical Test

IT is well known that the determination of the endurance limit of metal under alternating load is a time-consuming operation, requiring several test pieces each operating under a different stress until fracture occurs (or fails to occur at, say, 10 million repetitions). Short-time tests have been proposed, based on the theory that as long as each single crystal in the metal is acting in a truly elastic manner, the specimen will endure forever; or, stated in other words, the endurance limit has been passed, and fatigue failure will eventually occur, at a load which causes recurrent and permanent deformations even at one isolated point in the specimen. Since such permanent deformations require energy, the short-time endurance tests measure the temperature or the energy consumed by the metal specimen as it operates under gradually increasing load. S. Ikeda, of the research laboratory, Japanese Government Railways, Tokio, thinks that the endurance limit may also be quickly determined by measuring the electrical resistance.*

Figure 1 shows his instrumental set-up. The specimen *a* has conical ends and is chucked in ebonite grips to insulate it from the supports. Current from storage battery *B* is brought in through brushes *b* and *b'*, and regulated at 10 amp. by rheostats as shown. The specimen is 10 mm. in diameter, has thin flanges turned on it 120 mm. apart, and these dip into mercury cups. A potentiometer measures the electrical resistance between flanges *ff*.

To make the test, the load *W* is increased 1 lb. every 3000 revolutions, immediately after the potentiometer has been read. Running at 1500 r.p.m. this gives a reading every two minutes. Figure 2 gives parallel curves for several specimens of a 0.69-carbon Swedish steel; the electrical resistance is seen to increase when the bending stress averages 23,100 lb. per sq. in.

To verify the assumption that this represents the endurance limit, another test bar from this steel was run as a rotating beam, with a maximum stress of 21,600 lb. per sq. in. for 30,160,000 cycles of stress without fracture. On the other hand a similar test piece cut from the 0.88-carbon steel and loaded to a stress of 29,000 lb. (i.e., higher than the endurance limit as found by electrical methods, yet much below the true proportional limit) broke after 6,350,000 revolutions.

Similar tests were made on five steels as shown in Table I. Bars were machined after annealing one hour at 900 deg. C. and furnace cooling. Fatigue results are the average of at least four specimens; other physical properties are the average of at least three determinations.

Plotting the results of Table I in Fig. 3 shows several straight-line relations to exist. Hardness also varies directly with the carbon content.

Table I—Properties of Annealed Swedish Steels

	A	B	C	D	E
Chemical analysis					
Carbon	0.11	0.22	0.41	0.69	0.88
Manganese	0.42	0.44	0.35	0.23	0.24
Silicon	0.01	0.02	0.25	0.27	0.29
Phosphorus	0.015	0.014	0.028	0.027	0.024
Sulphur	0.021	0.018	0.020	0.023	0.021
Tensile properties					
Ultimate strength	46,700	49,600	75,000	92,800	110,000
Yield point*	27,900	28,700	33,000	35,500	35,900
Proportional limit	26,300	26,500	28,500	30,300	31,800
Elongation	39	35	24.3	14.3	6.5
Reduction in area	69	65	33	18.7	11
Hardness					
Brinell	87	95	139	168	207
Shore	18	20	24	30	35
Endurance limit by short test	12,600	15,100	17,200	23,100	27,300

*By plotting results from Martens' extensometer.

*Journal of Japanese Society of Mechanical Engineers, August, 1928.

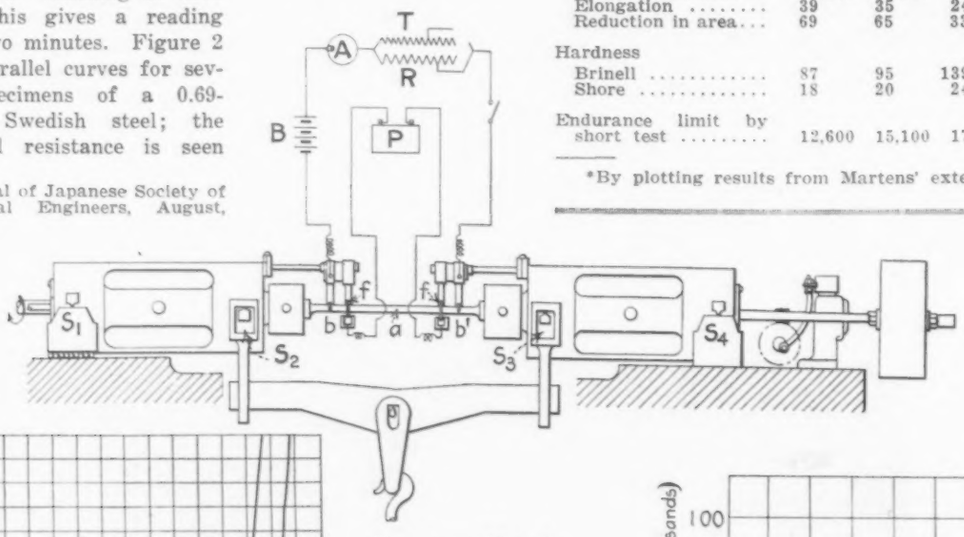


Fig. 1 — (Above) Diagram of Rotary Bending Machine with Electrical Connections for Rapid Determination of Endurance Limit

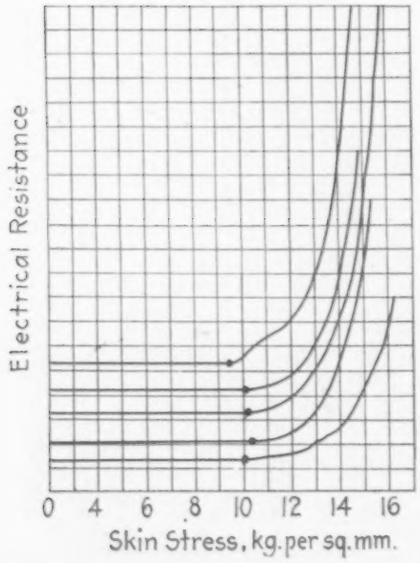


Fig. 2—(At Left) Parallel Curves on Five Test Bars of 0.69 Per Cent Carbon Steel, Showing Relation Between Bending Stress and Electrical Resistance

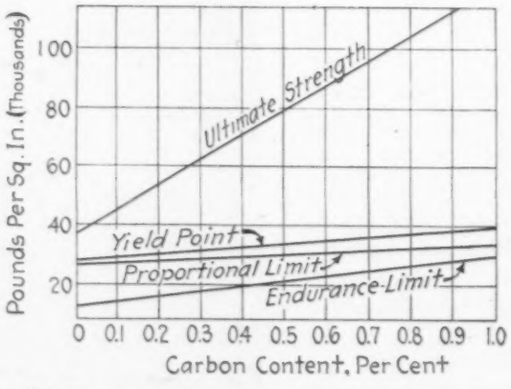


Fig. 3—(At Right) Straight Line Relation Between Carbon Content of Annealed Steel and Physical Properties

Electrochemists Meet in Toronto

New Data on Sponge Iron—Cyanide Bath Best for Cadmium Plating—Inhibitors for Corrosion of Iron—Electrolytic Iron at $30 per Ton

SPONGE iron, electroplating, corrosion and electric furnaces were among the topics at the fifty-fifth general meeting of the American Electrochemical Society held in Toronto, Canada, May 27 to 30. It was one of the largest conventions the society has ever held, registration approximating 315, with professors and metallurgists from many parts of the United States and Canada taking an active part. Members and visitors were housed in the spacious dormitories of the University of Toronto. All technical sessions were held in the Mining Building. The program included 54 papers, the largest number ever presented at one of these conventions. Only about 25 of these are to be printed in the *Transactions*, the others being available only in pre-printed form.

Better Steel Made from Sponge Iron

AT one of the sessions devoted to general topics there was an important paper entitled "Sponge Iron, a Raw Material for Electric Steel," by N. K. G. Tholand, Ekstrand & Tholand, New York. The paper gives for the first time information and data on the effect of the use of sponge iron in making high-grade electric steels in the United States. The company, with which Mr. Tholand is connected, is the importer of Swedish sponge iron, several thousand tons of which are brought into this country each year. In the absence of Mr. Tholand, detained in Washington on matters of business, the paper was presented in abstract by Edwin F. Cone, associate editor of THE IRON AGE, New York.

Sponge Iron Compared with Scrap Steel

Eight tables in the paper give complete physical results of the use of Swedish sponge iron in varying percentages at several different American and foreign plants. The author, in the early part of his paper, discusses the value of good raw materials for the electric furnace steel maker and compares sponge iron with present-day scrap. One of the main difficulties, says Mr. Tholand, has been the obtaining of a sufficient amount of cheap melting material with a phosphorus content below 0.015 per cent in order to keep the final phosphorus below 0.020 per cent. For straight carbon tool steel, which represents a large part of the production of the electric steel furnaces, the quality of the raw materials is of large significance. Available supplies of straight carbon, high-grade scrap, are more and more contaminated with elements such as nickel and copper, both of which are objectionable for straight carbon steel. As early as 1924 the average nickel content in steel melted in this country from straight carbon scrap was given as 0.15 per cent. Nickel steels, used chiefly in the automotive industry, find their way to the scrap dealers in increasing quantities. With such conditions it is evident that the importance of a steady source of supply of a clean iron, at a comparatively low price and low in carbon and impurities, is growing. Such a source is, however, even more essential to the maker of high-grade steels than it is to the commercial steel maker. Sponge iron, correctly made, will constitute such a source of supply, says the author.

Piercing Operations Easier with Sponge Iron Steel

In the difficult piercing operations of billets for tubes, made from steel containing sponge iron, piercing has proceeded with greater ease than ordinarily and with few rejections, says Mr. Tholand. The amount of sponge iron used in the charge varies, averaging 7 to 15 per cent of the total iron weight of the charge in this particular case. In other cases, 25, 40, 75 or 100 per cent of Swedish sponge iron constitutes the proportions used in the charges. Freedom from red shortness has also manifested itself in the violent operations of forging and piercing to which certain steels are subjected while red hot. Sponge iron steels show less cracking than other steels of good quality and, in this connection, well-known authorities express the opinion that a more elastic cohesion between the iron crystals in sponge iron steels may have a definite bearing on the hot and cold working of the metal, contends the author.

In concluding his paper Mr. Tholand states that he believes that sufficient actual results have been shown and published, on various occasions, to warrant extensive and definitely planned programs of investigation by every steel maker interested in high-grade steels. Trials, based on such programs, and proper cooperation between the consumer and the producer, would soon establish the real value of sponge iron properly made from a suitable ore. A certain reticence to publish results is apparent, especially results known in a general way to support the claims of sponge iron enthusiasts.

Present Cost and the New Tariff

After the presentation of the paper, Mr. Cone cited the fact that over 10,000 tons of sponge iron was exported from Sweden last year. Some users in this country are enthusiastic over the results obtained, particularly in wire, razor blade, tool and other high-grade steel. Improved physical and other properties are claimed. The cost of the imported sponge iron, under the present tariff, is $40, duty paid seaboard. At present sponge iron comes under the classification of pig iron. The new tariff bill proposes to place this material under the same classification as muck bar, which carries a much higher duty. Not only the importers of this material, but users and prospective American producers are protesting against this duty because of the increased cost and because a higher duty will carry with it a higher freight rate. They claim that there is no justification for classifying sponge iron with muck bar since the products are entirely dissimilar, muck bar having passed through molten and refining stages.

Some American Processes

Mr. Cone stated that he did not believe the Swedish people had anything to gain ultimately by opposing a higher tariff because, when American producers succeed in making sponge iron on a large scale, the Swedish product will be unable to compete with it and will be automatically eliminated from the market. Mr. Cone also cited a few facts concerning the Hornsey-Wills process. A plant based on this process at the Lorain, Ohio, works of the United States Steel Corporation is now operating on a large experimental scale. The new process of William H. Smith of Detroit was described in THE IRON AGE, April 25, page 1143. Another American process mentioned was that of Thornhill & Anderson of Milwaukee, a plant for which has been built in Japan. Ambitious claims are now being made

for these three American processes.

F. N. Speller, National Tube Co., Pittsburgh, stated that he felt that sponge iron was still in the decidedly experimental stage and that some of the claims made for it are yet to be established.

Ilmenite Reduced by Low Temperature Process

Another paper along similar lines to that of sponge iron was entitled "Metallization of the Oxide of Iron in Ilmenite," by R. J. Traill and W. R. McClelland, division of ore dressing and metallurgy, Department of Mines, Ottawa, Canada. The authors state that the metallization of the oxide of iron in this highly titaniferous ore, or magnetite, is accomplished by treating the crushed ore, mixed with coal and coke, in an oil-fired rotary kiln furnace, with the exclusion of excess air. The metallized iron, associated with the bulk of the titanium oxide, is separated from the unconsumed coal, coke and gangue material by magnetic separation. Over 92 per cent metallization of the iron is obtained. Leaching of the metallized product with a suitable solvent extracts the iron, leaving a high-grade titanium dioxide concentrate. A process such as this is believed to be ultimately of value to Canadian interests and to those owning iron ores in northern New York, where there are numerous deposits of ilmenite and titaniferous magnetite of considerable size and good grade. The analysis of a representative sample of the magnetic concentrate shows total iron content of 46.75 per cent, metallic iron 42.71 per cent, and titanium dioxide 41.22 per cent, with the remainder consisting of alumina, silica, lime and magnesia and 0.32 per cent of sulphur. Titanium oxide is usually employed in making certain grades of white paint and there are several applications for the iron in solution.

Plating Cadmium from a Cyanide Bath

ONE of the best papers on the electroplating of cadmium was presented by L. R. Westbrook, research chemist, Grasselli Chemical Co., Cleveland. It was entitled "The Electroplating of Cadmium from Cyanide Baths."

The author discusses in detail the cyanide bath for commercial cadmium plating from the standpoint of bath composition. He includes the effects of variations in the concentrations of the different constituents on the electrical properties of the bath, such as cathode efficiency, conductivity, throwing power, electrode polarization, anode corrosion and operating range of cathode current densities for satisfactory deposits. The effects of the presence of small amounts of other metals in the bath are considered, especially the marked improvement in the physical characteristics of the deposit resulting from the presence of a few hundredths of a per cent of nickel or of small amounts of cobalt or copper in the bath.

Nickel Is the Best Brightener

It has been found, experimentally, that nickel, cobalt and copper possess the power of brightening the deposit in decreasing magnitude in the order named. Nickel is the most important brightener and may be introduced into the bath in the form of any compound soluble in an excess of sodium cyanide such as the sulphate, hydroxide or carbonate of nickel. The use of nickel in this way results in a cadmium deposit which is brighter, smoother, of better color, more ductile, and apparently harder and denser than the deposits obtained from a duplicate bath without nickel or its equivalent. The advantage of using certain organic addition agents is discussed and formulae for typical baths are given. A recommended sodium cyanide bath contains sodium-cadmium-cyanide, sodium cyanide, sodium hydroxide, sodium sulphate, a brightener such as nickel in small amounts, and an organic addition agent. Tables in the paper give the actual composition of such baths and the cadmium concentration and current efficiency.

DR. F. C. FRARY
New President

Important Data on Chromium Plating

ANOTHER paper in the electroplating field was entitled "The Bent Cathode Test for Determining the Optimum Ratio of Chromic Acid to Sulphate in Chromium Plating Baths." The authors are Walter L. Pinner, chemical engineer, General Spring Bumper Corporation, Detroit, and Edwin M. Baker, assistant professor of chemical engineering, University of Michigan, Ann Arbor, Mich.

The authors insist that the control of the ratio of chromic acid to sulphate is most important in the operation of chromium plating baths. A rapid method of determining the proper quantity of either sulphuric or chromic acid, as the case may be, to be added to the bath to produce maximum throwing power is described. This method does not require a quantitative analysis of the solution for sulphate. It was used to study the effect of chromic acid concentration on the permissible range of ratio of chromic acid to sulphate. The effects on permissible sulphate ratio of trivalent chromium, and also of iron, in a 2.5 molar chromic acid bath were also studied. Qualitative observations on throwing power are reported. Referring to the curves in the paper, the following general conclusions are drawn:

1.—The widest range over which the sulphate ratio may be varied is in a bath containing, in addition to chromic and sulphuric acid, six grams per liter of iron.
2.—Increasing amounts of iron over six grams per liter rapidly contract the sulphate ratio range.
3.—The optimum sulphate ratio for a bath containing six grams per liter of iron is 70 instead of 50, whereas increasing amounts of iron lower the ratio to less than 50.
4.—Increasing amounts of trivalent chromium increase the required sulphate ratio. However, up to the equilibrium point of trivalent chromium there is little effect.
5.—Increasing the concentration of chromic acid from one molar to three molar increases the range of the sulphate ratio. Increasing the concentration beyond this point decreases the range at about the same rate.
6.—Increasing the concentration of chromic acid from one molar to six molar lowers the optimum sulphate ratio from about 75 to 30.

Recent Data on Corrosion of Iron and Steel

AT one of the sessions designated as a scientific-technical meeting, two papers on the corrosion of iron and steel were presented. One was entitled "The Electrochemical Corrosion of Painted or Lacquered Steel," with special reference to the alkaline peeling of the coat. The author was Prof. Ulick R. Evans, Cambridge University, England, who was the Campbell memorial lecturer at the annual meeting of the American Society for Steel Treating last September. In his absence the paper was presented in abstract, the main points being as follows:

When a drop of salt water rests on a steel sheet, protected by an imperfect coat of varnish or paint, the sodium hydroxide, formed as the cathodic product around the edges of the drop, may produce alteration or loosening of the coating, so that it can be removed by rubbing it quite gently. This loosening may extend over an area far exceeding that originally covered by that of the drop of water, owing to the creepage of the alkali over the metallic surface. There is comparatively little action with salts which do not produce caustic alkali. The peeling takes place if there is some slight porosity or imperfection in the paint, which allows a minute amount of corrosion, but an amount of corrosion, which would be harmless in its direct effect, may nevertheless

cause stripping over a large area. The nature of the metallic surface affects the result, while different varnishes and paints behave quite differently from one another.

It is impossible to forecast, says Professor Evans, the liability of a coat to "alkaline peeling" from its appearance, or from the degree in which it protects the metal from corrosion. Some coats which have a bad appearance resist peeling to a decided extent, while others of excellent appearance peel readily. Certain linseed varnishes, containing copal, are less susceptible to peeling than corresponding mixtures without copal. The introduction of certain pigments into the coat also reduces the danger of peeling, either by strengthening the coat, diminishing the permeability, or by keeping the metal passive. Thick coats are usually less susceptible than thin ones. Several observations have been made regarding the amount of different pigments in arresting or stimulating corrosion, and the conclusions reached are in general accord with those of Cushman and Gardner in the United States and of Ragg in Germany.

At present considerable work is being done in many countries on the deterioration of paint films, says Professor Evans. This work is mainly devoted to the slow changes which take place in the vehicle under the action of ultra-violet light, moisture and oxygen, especially when the films contain excessive quantity of dryer. The alterations of the pigments brought about by acids and salts are also being studied while attention is being directed to the chances of mechanical failure of the paint films due to expansion and contraction during periods of fluctuating temperatures. It is doubtful, however, whether this last effect is really a common cause of failure in new films. In general, all of these changes are slow and affect mainly the outer coat. It may well be asked why, when so much time and money are being expended on investigating comparatively slow types of paint deterioration, the relatively rapid type described in this paper has been neglected. The answer probably is that, although paints are largely used to prevent metallic corrosion, the majority of those who investigate paint problems pay comparatively little attention to the corrosion process. Perhaps they consider that the intermediate stages of the corrosion process are of no practical importance and that only the final results concern them. If so, the trouble described in this paper will serve as an example of the manner in which intermediate products of the corrosion process may adversely affect paints of otherwise satisfactory character.

Organic Inhibitors of Acid Corrosion

Inhibitors for preventing the acid corrosion of iron were discussed by J. C. Warner, department of chemical engineering, Carnegie Institute of Technology, Pittsburgh, in a paper entitled "Organic Type Inhibitors in the Acid Corrosion of Iron." The author presents further evidence tending to substantiate the theory that inhibitors of the organic type function by increasing the overvoltage required for the deposition of hydrogen. The effect of various concentrations of gelatine upon the energy required for the deposition of hydrogen on iron has been studied by the author and these results compared with the inhibitor action of gelatine in the acid corrosion of iron. The effect of small quantities of quinoline, aniline, bases from petroleum fractions, and bases from coal tar oils upon the energy required for the deposition of hydrogen has been studied, and the effectiveness of these substances as inhibitors for the acid corrosion of iron has been determined. The author's experiments indicate that any substance which will form a large positively charged oily ion or a positively charged, oily, colloidally dispersed particle, in acid solution, should inhibit the acid corrosion of iron if the substance cannot be electrolytically reduced.

PROF. LASH MILLER
Honorary Member

How Electric Tunnel Kilns Are Designed

A BRIEF description of the method followed in making the design of an electric tunnel kiln from data on the time-temperature cycle required by the materials which are to be heat treated in it is contained in a paper by J. Kelleher, electrical engineer, FitzGerald Laboratories, Niagara Falls, N. Y., entitled "Theoretical Considerations in Electric Tunnel Kiln Design."

According to their mode of operation electric furnaces for heat treating any material may be divided into two classes, says the author: Periodic operation and continuous operation. Under the first classification belong steel, silicon-carbide, brass, muffle furnaces, or any furnace in which a definite amount of material is heat treated, melted, etc., and then removed to be replaced by a similar amount of material constituting a new charge. Under the second classification fall such furnaces as the common Heroult type of alloy furnace, calcium-carbide furnace, etc., the heating being applied to new material continuously and the final product withdrawn as it is formed.

The author deals with a more obvious type of continuous furnaces known as the electric tunnel furnace. Circular hearth furnaces are similar in their heat transferring mechanism to the straight-tunnel kiln because they consist essentially of tunnel kiln bent into a circular shape with the entrance and exit close together, forming an annular tunnel or "circular hearth." The best results are obtained, in heat treating most materials, if a definite heating and cooling cycle is followed. The tunnel kiln is divided into different temperature zones through which the material is passed and, as it passes these various zones, it also passes through the desired heat-treating cycle. By curves in the paper, the author illustrates the heat-treating cycle of the muffle

New Officers of American Electrochemical Society

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furnace and the same cycle in a tunnel kiln. Both curves are similar but a new element enters into the tunnel kiln curve, namely distance or length, which is the product of time and velocity. The object of a tunnel kiln is primarily to conserve energy, labor and material, and also, in many cases, floor space. One question which is often raised in connection with furnaces of this nature, employing specific designs, is how does changing the furnace load, that is, varying the weight of material passing through the kiln, affect the operating characteristics. The answer is that in practice only small variations in loading need occur and these small variations produce almost imperceptible variations in heat treatment.

Electrolytic Iron at $30 Per Ton

AN important contribution to the electrolytic iron problem is contained in a paper, "Alkaline Electrolytic Iron." The author is Stewart J. Lloyd, professor of chemical engineering, University of Alabama, Birmingham, Ala. From laboratory data the author declares that the cost of making a ton of electrolytic iron by the method investigated in a 10-ton plant, with power at $35 per hpyr., would amount to between $30 and $35. In 1917-1918 Estelle suggested and patented the electrolytic deposition of metallic iron from a suspension of its hydroxide in strong hot caustic soda. Professor Lloyd has confirmed Estelle's results and extended the process to various ores of irons, studying at the same time the regeneration of the caustic solution by means of lime. An abstract of this paper will be published in a later issue of THE IRON AGE.

In other processes for depositing iron electrolytically acid solutions are a necessary evil requiring acid-proof materials for the cells, pumps, tanks, etc. This alkaline process obviates these objections.

It is difficult to say, says Professor Lloyd, what importance electrolytic iron will attain in the future, or even to determine if a low price will create an active demand. Certainly the method of making it by this process deserves a thorough study by any one contemplating its manufacture. The author is inclined to believe that this particular process might be applied with advantage to special types of ores, the Cuban ores, for example, which carry high alumina as well as chromium and nickel. Estelle has suggested its use for high manganese iron ores with a view to recovering the manganese values.

Dr. Frary Made President

BY letter ballot the officers for the ensuing terms were elected, as given in another column. Secretary Fink and Treasurer Acheson Smith were reelected.

Dr. Francis C. Frary, director of research, Aluminum Co. of America, New Kensington, Pa., was made president. Dr. Frary was graduated from the school of chemistry, University of Minnesota, Minneapolis, Minn., in 1905 with the degree of analytical chemist. He received his M.A. degree in 1906. He studied at the University of Berlin, Germany, in 1906-1907, and in 1912 obtained his Ph.D. degree from the University of Minnesota, where he was assistant professor of chemistry from 1911 to 1915. He was research chemist for the Oldbury Chemical Co., Niagara Falls, 1915 to 1917. In 1918 he was commissioned captain Ordnance Department, O.R.C., and later major chemical warfare service. He has held his present position since 1919. Dr. Frary is joint inventor with Dr. S. Temple of "Frary Metal," a bearing metal. He perfected the process of manufacturing phosgene gas on a large scale and was jointly responsible for the design and construction of the largest phosgene manufacturing plant in the world. He is a member of several technical societies.

A New Honorary Member

Taking his place along with Dr. E. G. Acheson, Dr. W. D. Bancroft, Dr. Edward Weston and Dr. Thomas A. Edison, Prof. Lash Miller was made an honorary member by the board of directors. Prof. Miller is professor of physical chemistry, University of Toronto, and is a charter member of the society. His contributions to the advancement of physical and electrochemistry have been notable. The announcement came as a surprise to Professor Miller at an informal dinner held Wednesday evening in the Great Hall of Hart House.

This dinner was held jointly with the Canadian Chemical Association, which commenced its convention the last day of that of the electrochemists. Sir Robert Falconer, head of Toronto University, presided, and welcomed both organizations. Speeches were made by Paul J. Kruesi, retiring president of the electrochemists, who awarded honorary membership to Professor Miller. M. l'Abbé Alexandre Vachon, president of the Canadian Chemical Association and rector of La Vallee College, Montreal, responded to a toast to his association. The banquet was followed by a brilliant dance.

A New Name for the Society to Be Voted Upon

A proposition is under consideration by the society to change its name to The Electrochemical Society, thereby making it more international in character. This will be voted on by each member later.

Next Meeting at Pittsburgh

From Sept. 18 to 21 the fall meeting will be held in Pittsburgh. A symposium on "Electrochemistry's Contributions to Aeronautics" is scheduled as well as a session on electric furnaces.

A plan is under consideration for an international meeting in Chicago in the fall of 1933.

There were 276 new members added last year, the most successful year in some time. Total membership is close to 2000.

Foremen's Convention to Be Held at Indianapolis

The National Association of Foremen will hold its annual convention at Hotel Claypool, Indianapolis, June 7 and 8. The program calls for registration and plant visitations Friday afternoon and an "Industrial Night Entertainment" Friday evening. The latter will consist of a series of short talks, illustrated by motion pictures taken in large plants, on the advancement of science and the development of industrial arts in manufacturing.

Saturday morning James J. Davis, Secretary of Labor, will speak on "Opportunities in Industry," and in the afternoon Alfred Kauffman, president, Link-Belt Co., Chicago, will talk on "Some Trends in Industry." Other addresses will include:

"Two Basic Principles of Good Work," by Dr. Harry Myers, Frigidaire Corporation, Dayton, Ohio.

"Wage and Production Incentives," by H. H. Flagg, General Motors Corporation, Detroit.

"Elimination of Waste in Industry," by G. E. Tibbits, S. F. Bowser Co., Fort Wayne, Ind.

"Developing Our Personality," by Harry N. Clarke, Business Clinic, Cleveland.

"How We Can Interest Our Men in Order and Care of Property," by Dr. Harry Myers.

"How to Keep Men Interested in Their Work," by G. F. Buxton, Purdue University, Lafayette, Ind.

"Budgetary Control for Foremen," by William Baum, Real Silk Hosiery Mills, Indianapolis.

"How to Plan Your Work," by John Doran, G. A. Gray Co., Cincinnati.

"Advantages to Be Obtained from a Shop Foremen's Club," by Carl L. Storck, General Motors Corporation, Detroit.

"Getting Information from Trade Magazines," by H. L. Neilson, field representative, *National Foremen's Magazine*, Dayton, Ohio.

St. Louis Foundrymen Elect Officers

The St. Louis District Foundrymen's Club, meeting at the American-Annex Hotel, St. Louis, May 21, elected the following officers for the coming year: President, Horace R. Culling, Carondelet Foundry Co.; vice-president, Walter C. Raithel, Mound City Foundry Co., secretary-treasurer, Leo J. Filstead, John C. Kupferle Foundry Co. Members elected to the executive committee are George Mellow, Liberty Foundry Co.; Ralph Hill, East St. Louis Casting Co.; Roy Jacobsen, Commercial Foundry Co.; Frank Rogers, Excelsior Foundry Co.; Francis O'Hare, Central Brass & Aluminum Co.; H. P. Hubbell, Semi-Steel Casting Co.

Diamond Tool Boring Machines

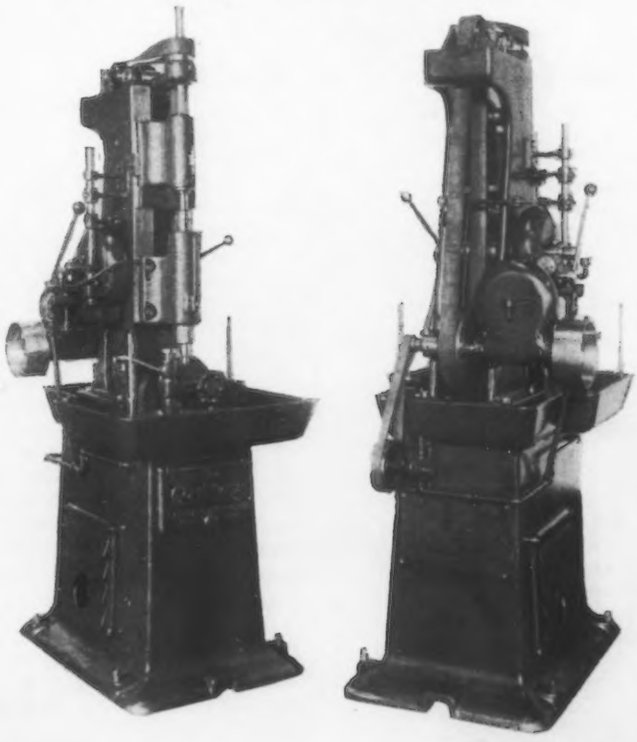
Finish-Boring Connecting Rods, Pistons and Other Parts to Close Limits at High Production

THE use of diamonds as cutting tools where close precision limits and high finish are essential is satisfactory only with machines that operate entirely free from vibration. Vibration destroys the cutting accuracy, slows up the cutting speed and shortens the life of diamond tools to an extent that makes their use impractical where it exists.

Diamond tools, therefore, require special machines in which particular attention has been given to the elements of smoothness of feed and drive rigidity and precision. When so used the diamond, it has been proved, will bore to such limits as 0.0001 in., leaving a finish equal to a lapped and polished surface.

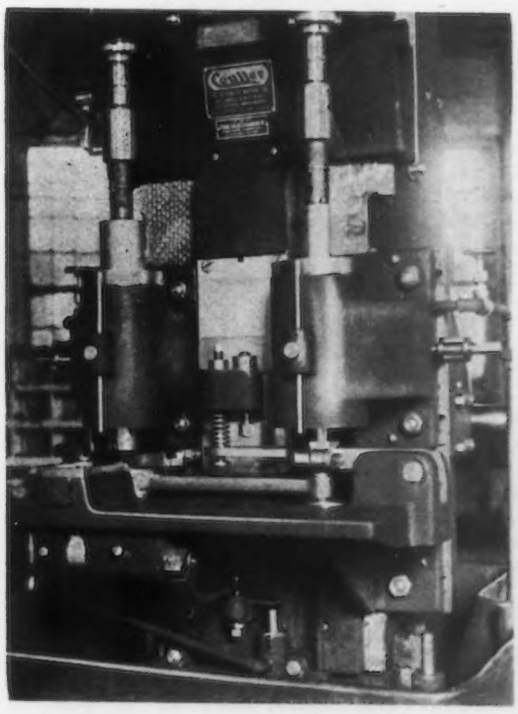
One such "special" design machine is the Coulter diamond tool boring machine, built by the Automatic Machine Co., Bridgeport, Conn., for the use of diamonds as cutting tools for finish-boring to close precision limits at high production speed. The Coulter machine is built single or double spindle and is used for finish-boring either or both ends of automotive and airplane engine connecting rods, wrist-pin holes in pistons, precision boring of die castings, bearings and various other parts.

The machine is adaptable by equipment with jigs and fixtures designed for the particular job to be done. These fixtures are applied to the lower face of the column and may be hand operated or of automatic type, in which case they have automatic clamping and releasing devices timed with the cycle of the machine.



Two of the automatic fixture set-ups are shown herewith. One is used for boring wrist-pin holes in aluminum - alloy pistons and the other is for boring simultaneously the babbitted and bronze ends of connecting rods. The floor to floor time for boring either is 30 sec.

Except for loading and unloading, operation of the machine is entirely automatic. When the starting lever is tripped the spindle or spindles descend rapidly until the diamond tool almost touches the work. The tool then automatically begins to revolve, passing through the work at a predetermined boring speed. Upon completion of the boring the tool ceases to rotate and the spindle ascends to its initial upper position. The fact that the tool does not rotate

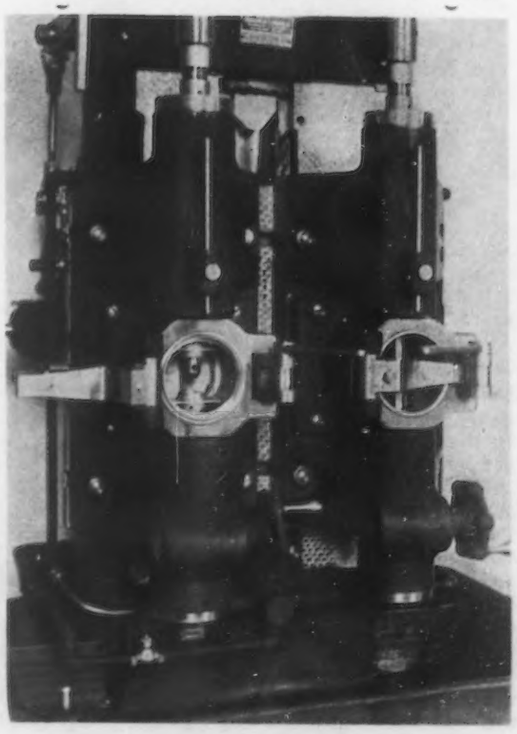


Precision Boring with Diamond Tools

* * *

THE double spindle machine shown to the right covers the jig and fixture set-up for an aluminum-alloy piston job.

The view to the left is of the set-up for diamond tool boring at one time of the babbitt and bronze ends of connecting rods



while being withdrawn from the work prevents its making scratches on the finished bore.

The drive is accomplished either with an individual motor, space for which is provided in the base, or by counter shaft. The cycle of operations is controlled through automatically operated friction clutches of the spring-loaded type to safeguard from overloading or accidental interference with the automatic movements.

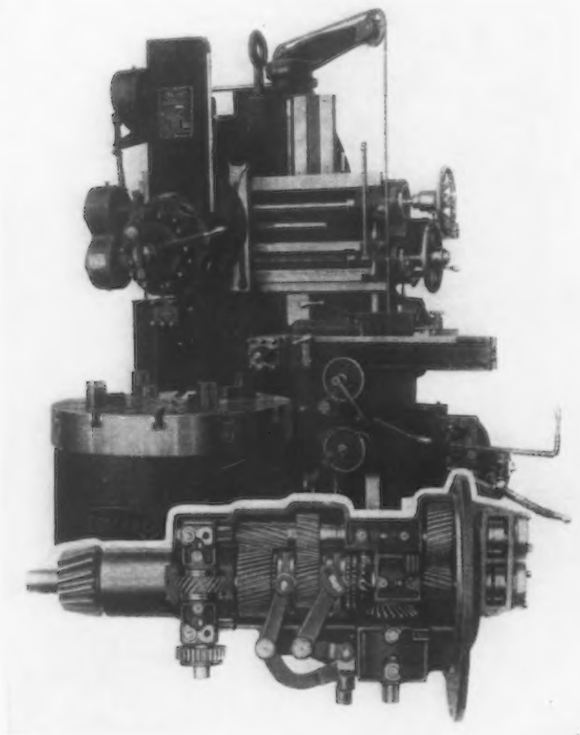
Vertical motion of the spindles on the double spindle type is controlled by a cam; that of the single spindle is controlled by chain belt driven by an enclosed worm gear. The feed and its driving mechanism are located inside the box section upper column. The boring bars are separate from the upper driving spindles and are attached by means of Oldham-type floating couplings.

Cutting compound is supplied under pressure to the diamond tools and the sleeve bearings of the boring bars by means of a pump driven from the horizontal rear shaft, lubricating the tools and holding chips in suspension to prevent scratches on the finished surface.

The machine occupies a floor space 36 x 46 in. The net weight of the single spindle model is 2800 lb. and that of the double spindle 3800 lb.

Machine Tools Fitted to Use Tungsten Carbide

THROUGH a recent series of improvements, Bullard Machine Tool Co.'s vertical turret lathes of the "spiral drive" type have been brought to a standard assuring their ability to operate with the latest cutting materials. Within the past year, spindle speeds have been increased in the manufacturer's specifications and the recommended power for motor drive has been selectively raised, with adequate strengthening in construction on the various models, from 25 to 40 per cent above previous ratings.



Constant Flow of Power Through Strong Gear Teeth Provides Smooth and Powerful Cutting Action in This Speed-Change Case. The spiral and helical gears give a rolling action producing this result

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At Lower Right Is an Automatic Lathe-Work Driver to Eliminate Use of Dogs

This is naturally the result of a period of research and analysis into the requirements of the work encountered, and the determination of a method for properly employing the higher-speed cutting metals. It is the opinion of Bullard engineers that the use of tungsten-carbide tools should be based primarily on a selection of those operations to which such tools can be economically applied, together with a determination of the consistent rates of speeds and feeds which will assure a proper life of such expensive tool bits.

The nature of face-plate work and the various diameters encountered determine the operations of higher feet a minute, which justify the use of such cutting tools, while the smaller diameters of necessarily lower feet a minute would not, under simultaneous operation, require more than the regular type of high-speed tools previously available. An analysis of the methods involved and the rates of cutting forms an interesting background from which has developed the revision of design in the important drive unit in Bullard vertical turret lathes.

The secondary speed-change case, as shown in foreground in the illustration, is now designed with a complete train of spiral and helical gearing, properly balanced or controlled in thrust, and providing a smooth and powerful flow of the work under the cutting tools. The rolling action of spiral and helical gears offers a strong gear tooth and a constant flow of power through the driving train to the table.

This secondary case, combined with the standard primary construction, provides variously eight and 12 different rates of speed through the respective sizes of machines in which it is applied. And the new table speeds obtainable through this unit, though varying with each size of machine, offer reasonable minimum diameters of work at which tungsten carbide and similar tools can be consistently employed under maximum efficiency of operation.

Automatic Driver for Lathe Work

FOR about two years the Seneca Falls Machine Co., Seneca Falls, N. Y., has been supplying to its customers a patented automatic driver which eliminates the necessity for dogging work. This driver has worked out so satisfactorily that the company has decided to place it on the market.

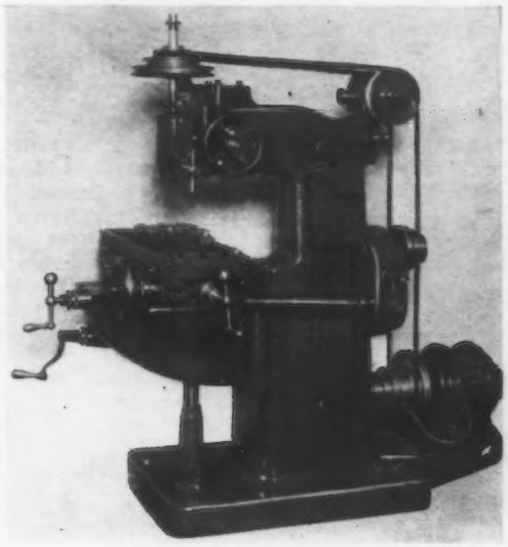
Arrangement of the driver is such that it may be applied to any machine by the use of a chuck plate similar to that used in applying standard chucks to lathes. As will be noted from the illustration, the work is gripped by means of two corrugated jaws, the corrugated surfaces being somewhat eccentric to the pivoting point.

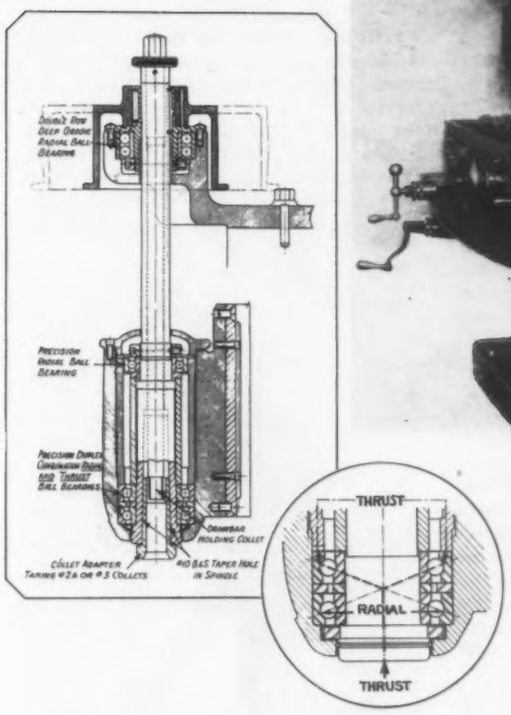
The jaws are mounted in a slide which is free to float in a transverse guide in the driver-head, so that, regardless of whether or not the work is properly centered, there is no danger of putting an excessive amount of pressure on the head center. The construction of the driver is covered by letters patent.

United States production of bituminous coal in the calendar year through May 25 is estimated by the Bureau of Mines at 207,744,000 net tons. This is 8½ per cent more than the 191,518,000 tons to the corresponding date of 1928, but is nearly 11 per cent less than the total at the same date in 1927.

Die Sinking and Vertical Milling Machine

FOR engraving, light die sinking, tool room and general manufacturing purposes, Reed-Prentice Corporation, Worcester, Mass., has put out a ball-bearing die sinking and vertical milling machine, No. 3. The entire machine, here illustrated, has the rigid, full-box form of the knee designed especially to eliminate vibration troubles.




Double Row Deep Groove Radial Ball Bearing
Precision Radial Ball Bearing
Precision Duplex Combination Radial and Thrust Ball Bearings
Drawbar Holding Collet
Collet Adapter Taking #2A or #3 Collets
#10 B&S Taper Hole in Spindle

UNUSUAL Rigidity in the Head Is a Feature. The ball-bearing layout is shown in line cuts

Spindle speeds to meet average requirements are furnished through 5½-in. and 10-in. spindle drive pulleys. Speeds as high as 4000 r.p.m. are obtainable through the use of ball bearings for spindles (radial and thrust bearings), pulleys and countershaft. The speed range goes down to 67 r.p.m. on the low-speed set-up. Motor may be constant-speed, with 1200 or 1800-r.p.m. motor, or adjustable-speed, with range of 500 to 2000 r.p.m. A motor of 2 hp. is recommended.

Spindle has ground journals mounted on ball bearings, taking both radial and thrust loads. The adjustable head carrying the spindle has a micrometer depth stop. As the upper bracket carrying the belt takes the belt pull, the spindle is allowed to rotate freely. Proper belt tension is secured by adjustment of the movable idler pulley bracket.

Table, of liberal proportions, has a working surface of 10¼ x 30¾ in., and has longitudinal power feed. The carriage has a wide center bearing on the knee and supports the entire working surface of the table. This gives extreme rigidity to the knee unit and keeps the table permanently alined with spindle. Both longitudinal and cross-feed screws are arranged with micrometer dials and ball thrust bearings, while the knee is raised and lowered by telescoping screw.

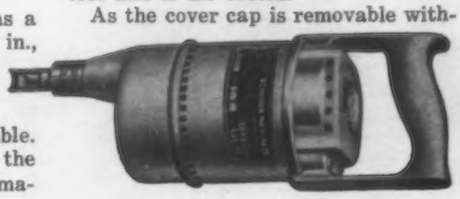
Rotary attachment with power feed adds to the machine's range of work; this can be added at any time. It is equipped with both power and hand feed and has oil pan graduated through 360 deg. The rotary table working surface is 13 in. in diameter.

Floor space occupied is 67¾ x 72¾ in. and the machine is 67¾ in. high. The range of power longitudinal feed is 21 in.; of cross feed, 12 in.; vertical feed of knee, 17 in.; head travel, 3½ in. Net weight, without rotary, is 2400 lb. The rotary weighs 110 lb.

Portable Electric Drill and Screw Driver

TWO tools recently developed by the Schauer Machine Co., successor to the Neil & Smith Electric Tool Co., Cincinnati, have a number of advantages. The ¼-in. drill and the screw driver, as illustrated, both employ the same motor, which is unusually powerful for this size of tool and is air cooled.

As the cover cap is removable without disturbing bearings or electrical connections, this permits inspection of the motor while running. Both are ball-bearing, with inclosed ball thrust bearing and heat-treated nickel-steel gears running in grease. The studs, of the same material, are supported at top and bottom.



The screw driver is equipped with a screw slot finder and finder bit, but can be operated without the finder if necessary, or with socket bits for nut tightening. One principal feature is that no moving parts are exposed, to mar the work, in case of slipping or close corner operation. The positive clutch and thrust bearings are located in the gear head. This feature provides positive lubrication and allows the use of a large-diameter clutch, which insures great strength.

Weights are 6 lb. for the drill and 6½ to 12 lb. for the three sizes of screw driver.

Combination Nibbler and Drill Rod Cutter

FOR cutting templets or other irregular shapes from sheet steel or brass the National Machine Tool Co., Racine, Wis., has brought out a new tool, which may be used also as a drill rod cutter. Known as the Handnib, the features claimed are exceptional speed of nibbling and great power. The capacity for flat stock is up to ⅛ in. thick; for cutting rods, up to ⅜ in. in diameter.

In cutting sheet metal the advantage is said to lie in avoidance of costly hand bench work, especially with regard to trial blanks for metal stamping work. The nibbling blade is ¼ in. thick. Inside nibbling may be performed, after one hole is drilled, and may be carried as much as 3 in. from the nearest edge. Interchange of blades, between outside and inside nibbling, is accomplished through two screws.

Cutting drill rod is said to be done without distortion of the rod. For either use the machine is mounted in a vise, as shown, or on a bench.

Lift Truck with Gas-Electric Power Unit

AN important recent development in electric truck equipment is the use of a gas-electric power unit in place of storage batteries for supplying current for the operation of the truck. This unit consists of a gas engine directly connected to a low-voltage generator. While not discontinuing storage batteries as standard equipment, most truck manufacturers will substitute the gas-electric power unit, in case the customer prefers it to a storage battery.

ELECTRIC Lift Truck with Power Derived from a Gas Engine Driving a Generator. This equipment is obtainable in two sizes

Gas-electric trucks are said to be especially good for long hauls, and thus for continuous service. The one illustrated is from the Elwell-Parker Electric Co., Cleveland.

Operation of the gas-electric truck differs in no way from the battery-propelled type and the flexibility of control is retained. There are no changes in the controller, foot switch or brake. Aside from cranking the unit in starting, the driver has nothing new to learn. If trucks are equipped with lift platforms or cranes, power is supplied to the lift and hoist motors. The governor, which is of the mechanical type, automatically adjusts the engine load to requirements. The generator delivers power to the motor at proper voltage.

The gas-electric power unit is complete in itself. It consists of a 4-cylinder Continental motor directly connected to a low-voltage generator, and with all accessories is mounted on springs in a steel compartment suitable for fastening to the truck chassis. The engine, except when idling, operates at a constant speed and has magneto ignition. The generator delivers the power to the operating motors through the usual controlling devices employed for storage battery operation. The unit occupies somewhat less space than the storage battery, but its height is slightly greater. The structural frame has perforated end covers and a hinged top, 40 in. long, 22½ in. wide and 27 in. high, serving as a housing.

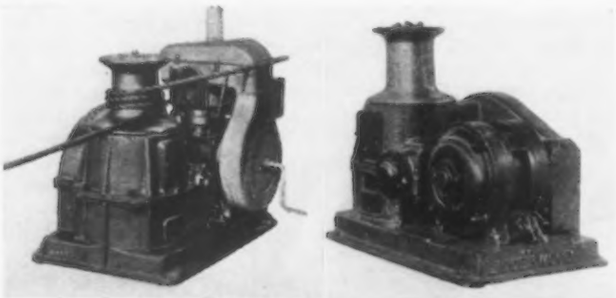
The unit is made in two sizes, one for operating tractors equipped with 24 to 30-volt motors and the other for tractors with 48-volt motors. Its rated capacity is 18 to 22 hp. It is equipped with a pump for circulating the water and a pressure oiling system. The power unit is manufactured by the Ready-Power Co., 3820 Grand River Avenue, Detroit.

Gas and Electric Capstans to Spot Cars in Plants

FOR moving freight cars and barges in industrial plants, the Lidgerwood Mfg. Co., Elizabeth, N. J., is marketing a new vertical capstan known as the Tugmore. Compactness has been emphasized in the design, reducing the space requirements to 25x34 in. It is claimed that, with the installation of a Tugmore capstan loading or unloading may be maintained without the necessity of assigning a crew of men to shift cars.

The Tugmore has been made a standard type, and is available from stock in five sizes: 5 and 7½ hp. alternating current, 5 and 7½ hp. direct current, and a 6 to 8 hp. twin-cylinder air-cooled motor using gasoline or kerosene for fuel.

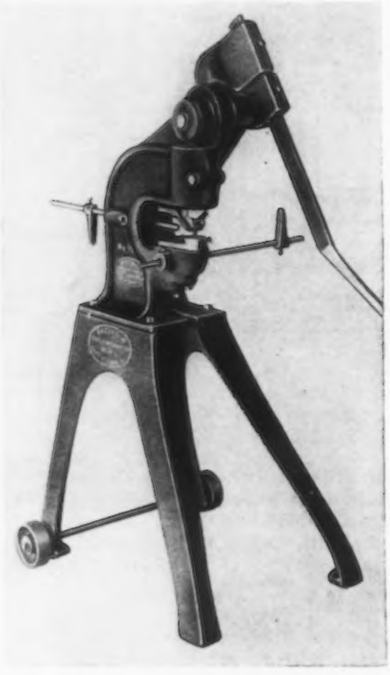
As capstans are frequently installed in exposed locations, the adoption of the air-cooled motor to drive the capstan is important, for the freezing hazard is avoided. Three types of anti-friction bearings, running in oil, are used in the Tugmore and both electric and gasoline types are of weather-tight construction.



SELF-CONTAINED Hauling Units, the One at the Right Being Motor Driven, While the Other Is Actuated by a Gasoline Engine

Portable Ball-Bearing Lever Punch

FOR use on erecting and assembling floors, the Excelsior Tool & Machine Co., East St. Louis, Ill., is offering a lever punch with capacity for punching 5/16-in. holes through 5/16-in. sheet iron and ½-in. holes through ¼-in. brass. Ball bearings are provided on the eccentric and main shafts to facilitate operation of the machine, and the stand is equipped with legs that protrude forward so that the machine cannot tip when punching to capacity. The two wheels at the back permit moving the machine conveniently. The operating handle is balanced so that it is always in the upright position, and the stripper is placed so that it does not obstruct the view of the punch. The gages at the front and the side are adjustable.



Ball Bearings on the Eccentric and Main Shaft Make for Easier Operation

The slide is square and provision is made for taking up wear. The tool steel bushing in the slide will take a 7/16-in. punch shank, and by removing this bushing a ⅞-in. punch shank can be used. The height of the machine, designated as the No. 19, is 51 in. overall, and the weight is 450 lb. The depth of throat is 6 in.

Fireless Locomotive in Industrial Use

REFERENCE was made on page 938 of THE IRON AGE of April 4 to the use of three fireless switching locomotives operating on live steam. These are employed in the plant of the National Cash Register Co., Dayton, Ohio, drawing their supply of steam from a header alongside the main boiler room. Hot water accompanies this steam and the charge, so to speak, permits the engine to be operated for about 3 hr. before the pressure drops enough to make it necessary to recharge. This means of motive power frees the factory yards of cinders, smoke and soot and also of electric conductors and avoids the fire danger of sparks.

Marking Machine for Hard Steel

A RAPID-PRODUCTION machine built for marking the guards of safety razors with the trademark and "Made in U.S.A.," and equally adaptable to other insignia, has been put out by the Noble & Westbrook Mfg. Co., East Hartford, Conn. Metal strips, which are afterward cut into ten pieces, are run into the machine and marked at the rate of 40 strips a minute, which means 400 completely marked razor guards. This is 800 separate marks a minute.

The machine is fed by hand by an operator, who can easily keep two machines supplied. The starting lever and feed pins on the machine are controlled by springs, to eliminate chances of damage to the strips, in case a strip is started wrong.

The marking die used is made in the form of a roll 2½ in. in diameter, on the periphery of which five trademarks and five inscriptions "Made in U.S.A." are engraved. The feeding mechanism is operated by a cam and timed so that the bottom strip in the magazine is started to pass under the die as soon as the preceding strip leaves it. The strips are carried along and marked automatically; all the operator has to do is to keep the magazine filled.

Working parts are largely inclosed in the main casting, which is mounted on a suitable base. The drive is from a ¼-hp. motor, through a rack and gear which runs continuously in oil.

Some of the Work of the Machine Is Shown in the Strip Beneath It

Pulverizer for Various Materials

AN improved impact-attrition pulverizer for operation on many different materials is being offered by George F. Pettinos, 1206 Locust Street, Philadelphia. Ores, limestone, hydrated lime, coal, coke, phonograph records, resins and analogous materials are reduced to a uniform fineness in many cases, without the need of air separation.

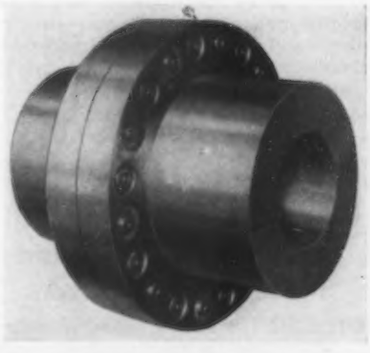
A heavy vertical chrome-nickel forged shaft supports three steel disks upon which are firmly bolted heavy chrome-nickel alloy hammers. Each disk with its set of hammers revolves in its individual pulverizing chamber, which consists of a corrugated alloy breaker ring, concentric with the disk. Each chamber is separated from the adjoining chamber by corrugated ledge plates, at both top and bottom.

A horizontal shaft transmits rotation to the vertical shaft through spiral bevel gears, the ratio of which may be made to accommodate motor, turbine or belt drive. The case is split vertically for accessibility. All bearings are heavy duty, self-aligning, with individual oil pumps.

Material up to 1½ in. size is fed in at the top of the machine and discharged in uniformly pulverized state. Owing to the construction details, the pulverizer itself acts as a separator and holds back all materials until they reach the desired fineness.

Unusually Large Flexible Coupling

A FLEXIBLE coupling recently shipped to the International Paper Co., Corinth, N. Y., for installation between a water-wheel and a speed increaser, is unusual in that the coupling is said to be the largest of its kind ever built. The coupling will be used



to transmit 1200 hp. at 220 r.p.m.; it weighs 2000 lb., and was furnished by the Ajax Flexible Coupling Co., Westfield, N. Y.

Engineers have maintained that a coupling of this type (pin, bushing and rubber bumper) would not stand up in the larger sizes. This theory has been definitely disproved in practice, and couplings have been built by the Ajax company in large sizes for heavy duties up to 12-in. bore.

Ore Mining Companies Win Safety Awards

M. A. Hanna Co. and Oglebay, Norton & Co., Victors in National Competition

WITH no lost-time accidents during the year to mar their record, two iron ore mines in the Lake Superior district operated by Cleveland companies have been adjudged winners in the National Safety Competition for 1928, conducted under the auspices of the United States Bureau of Mines. The winners are the M. A. Hanna Co., operator of the Wakefield mine of the Wakefield Iron Co., Wakefield, Mich., and Oglebay, Norton & Co., operators of the Berkshire mine at Stambaugh, Mich. The successful contestants have been awarded bronze trophies entitled "Sentinels of Safety," which will be formally presented later.

The awards were announced by Secretary of Commerce R. P. Lamond and Scott Turner, director of the Bureau of Mines. That bureau will also give each employee of the two mines a certificate of honor in recognition of his contribution toward the success of his employer in winning the trophy.

The two awards come under two separate groups in the competition, each mine winning in its own group. The Wakefield is an open pit mine and the group in which it was included comprised all the open pit mines and quarries in the United States. The Berkshire mine, an underground mine, was the winner in the metal mine group that includes the underground mines.

The Wakefield mine employed about 125 men in 1928. It is owned jointly by the M. A. Hanna Co. and the Inland Steel Co. It was first opened in 1913 and has produced and shipped 8,883,816 gross tons of ore. The mine has a vertical depth of 400 ft., is about three-fourths of a mile in length and about 400 ft. wide. The Rogers mine, located at Iron River, Mich., and owned and operated by the M. A. Hanna Co., received honorable mention in the 1928 competition for the underground metal mine group, having had no lost-time accidents during the year.

The Berkshire mine, winner of the underground mine trophy, employs 180 men. Last year it mined 302,319 tons or ore and consumed 403,487 manhours. It has had but one minor lost-time accident since May, 1927. This mine won third place in the 1927 contest, and was awarded honorable mention. Last year the Bristol mine, also under the management of Oglebay, Norton & Co., was the winner of the trophy in the metal mine group.

Parker Rust-Proof Co. in a Merger

The Parker Rust-Proof Co., 2177 East Milwaukee Avenue, Detroit, and the Wolverine Enameling Co., Detroit, have been merged, the new corporation retaining the name of the Parker Rust-Proof Co.

The Parker company has developed a new process called "Bondering," a primer base for paint, enamel or lacquer, when applied to steel, and the plant and business of the Wolverine Enameling Co. was acquired for the laboratory and experimental work in connection with the application of this process.

The consolidated company has assets of $1,500,000.

Steel Corporation Now Insures Home Buyers

The United States Steel Corporation has had in successful operation for some months an amendment to its home owning plan whereby every employee who borrows money to build or buy a home is obliged to carry a life insurance policy in the amount of the loan.

This plan was inaugurated in September, 1928. The object is not only to protect the corporation against loss of principal, but also to protect widows of employees against any financial embarrassment or loss in the event that the home buyer dies before his loan payments have been completed.

The insurance plan is mandatory, but a low-rate term insurance policy under a group plan is carried, and the cost to the insured is very small.

Up to the end of last year more than $9,000,000 worth of insurance had been written on the lives of 3062 employees who are buying homes.

New Airplane Company to Build Plant in Michigan

The International Aircraft Co. of Michigan has been organized by men prominently identified with the automotive industry. It has purchased the entire assets of the International Aircraft Corporation of Ohio, which has a plant in operation at Ancor, Ohio, a suburb of Cincinnati. A plant will be built at Jackson, Mich., and when that is completed in about six months the manufacturing operations will be moved from Cincinnati to Jackson.

T. P. Funk, chairman of the board of the Automotive Fan & Bearing Co., Jackson, Mich., and a former vice-president of the Moline Plow Co., heads the new company as president. D. G. Morrison, who was formerly general manager of the Morrison Metal Stamping Co., is executive vice-president and general manager. Edwin M. Fisk is vice-president in charge of design. Charles Hollerith, who is general manager of the Automotive Fan & Bearing Co., is secretary-treasurer of the airplane company. C. B. Hayes, former president of the Hayes Wheel Co., and now a director in the Kelsey-Hayes Wheel Co., is chairman of the board. In addition to the officers, there are two other members of the board of directors: Mark Merriman, former vice-president of the Hayes Wheel Co., and H. S. Robertson, investment banker, Detroit.

Trade Commission Rescinds "Clandestine" Rule

WASHINGTON, June 4.—With Chairman E. A. McCulloch dissenting, the Federal Trade Commission last week voted to rescind the so-called "clandestine" trade practice conference rule adopted last October. This rule, which had been included in group 2 resolutions, provided that the "clandestine" violation of this class of resolutions would be considered an unfair method of competition. These resolutions are accepted by the commission as expressions of industries participating in trade practice conferences. The position of the majority of the commissions is understood to have been that the "clandestine" resolution makes unlawful what has heretofore been lawful and that the commission did not have the power to enforce this or other resolutions in group 2. The contention has been made that the commission has attempted to enforce the observance of rules in group 1 because the acts that they prohibit are unlawful practices and condemned by the statute. Commissioner Humphrey has taken the position that the "clandestine" rule was an absurdity.

In the course of an address last December, he said:

"The proposition that the commission, a public body, the acts of which are open to the widest publicity, can issue a valid order after complaint and trial against anyone to cease and desist from following a plan of unfair competition clandestinely, is impossible, and the mere statement of the case shows the ridiculous absurdity of the proposition. As well say that a bank could advertise in the papers that on holidays it would clandestinely keep open its doors."

Commissioner Humphrey also insisted that there was a widespread feeling that the effect of the "clandestine" resolution would largely injure, if not completely destroy, the trade practice conference system. He said it has alarmed business.

In his dissenting memorandum, Judge McCulloch expressed the opinion that the commission's policy of preventing secret violations of trade conference rules was not invalid and should not be abandoned. He said that the policy was at least an adventure which could, if pursued, result in no harm to business interests and, on the contrary, might be helpful.

Uneconomic to Concentrate Manganese Ore

American Iron and Steel Institute's Tariff Committee Therefore Renews Demand for Putting It on Free List

WASHINGTON, June 4.—Apparently the determined effort to change the tariff rates on manganese ore will be continued in Senate committee. The revised bill recently passed by the House left the duties unaltered. A brief has just been issued by the tariff committee of the American Iron and Steel Institute arguing for manganese ore to be placed on the free list, and the duty on ferromanganese reduced to 25 per cent ad valorem. To counteract this effort, the American Manganese Producers' Association is preparing to renew its request for an increase to 1.5c. per lb. on manganese ore. Representatives from States having deposits of manganese ores made a vigorous but losing fight to have the present duties apply to ores containing as low as 10 per cent manganese, instead of 30 per cent or over, and this proposal will undoubtedly be reargued.

In its statement recommending repeal of the duty on manganese ore, the tariff committee of the American Iron and Steel Institute declares that the 1c. duty on that product has been equivalent to an ad valorem duty of 81.58 per cent during the past six years and that it "has failed utterly to bring about a domestic production that is other than insignificant, while it has at the same time added enormously to the cost of producing steel. In other words, the consumers of manganese—which means ultimately all who ever make use of steel in any form—have been uselessly taxed, while no domestic industry has been benefited or built up."

The statement says that the duty on manganese ore and manganese alloys has involved an additional cost in the production of steel of $45,771,328 from 1923 to 1928, inclusive. Despite the tariff, it is pointed out that 95 per cent of the country's requirements of metallurgical grade manganese have been imported. Quoting figures from the Bureau of Mines, the statement deduces that the country's annual requirements are nearly 20 times the domestic production during the entire six years just passed of extremely high tariff protection. These results are declared to be due to fundamental geological facts. Only a small reserve (approximately two years' requirements) of manganese ore of commercial grade exists in this country and reserves of low grade manganese ores are not adaptable as a substitute for the imported ore.

To justify its position on ferromanganese, the statement says that the present duty on 80-per cent ferromanganese is $33.60 a gross ton. The tariff on the imported ore necessary for this much ferromanganese is about $21. The difference between the ore and alloy duties is therefore $12.60. Since the foreign value of ferromanganese is approximately $50 a gross ton, the suggested duty of 25 per cent ad valorem would be equivalent to a specific duty of $12.50.

"In the very nature of things, any domestic production of manganese ore must be obtained only under great economic loss to the nation and at great additional expense in the cost of production of steel products which enter into nearly every phase of American life," the statement of the Iron and Steel Institute's committee concludes.

"Those few mining interests who are now actively engaged in promoting the tariff on manganese admit that practically no commercial grade manganese in its natural condition exists in this country, but they contend that concentration processes have recently been developed whereby low grade manganese material may be beneficiated and changed so as to make it suitable for steel purposes. This is not true. All of the developed concentration processes have been well known for many years and are not new to those who have been engaged in this problem. It is not practicable to apply such processes for the production of any substantial quantity of domestic manganese ore. The consumers of manganese (the steel industry) are the largest owners of low grade manganese ore deposits and if any concentration of these ores is possible they will be the first to adopt and apply such methods.

"From a national standpoint the subject may be summarized by saying that the steel industry has always used manganese; that the steel industry has been notable in its efforts to be completely integrated and to own and produce all of its crude materials in this country; that no manganese ore is mined in this country by any steel company; that every effort has been made by the steel industry to discover suitable manganese deposits, without success; that the steel industry has spent a great deal of money in research in and development of concentration processes for the utilization of low grade manganese ores, which processes have all been abandoned or set aside as unsatisfactory or impracticable; that the low grade manganese ores found in this country are now being used in their natural condition by the steel industry in the production of manganese pig iron; *that if there is any product which should be on the free list of a tariff act it is a crude material such as manganese ore, of which we have practically no supply in the United States;* that to place tariff duties of 100 per cent or over on manganese ore is to do violence to the protective policy; that it results in a discriminatory tax burden and increases the cost of steel products; that it encourages ill-advised investment in supposed domestic manganese deposits; that it leads to uneconomic activities in concentration and beneficiation processes; that it definitely exhausts the only domestic supply of manganese which might be of value to the country in an emergency; that it deters the American steel industry from assuring its source of supply in foreign countries where such supply exists; and that it invites, and already it has resulted in, foreign retaliation."

All-Electric Welded Gas Line in Desert

What is thought to be the first completely arc-welded gas line is now under construction in the 200-mile stretch of pipe from Jal, in the extreme southeastern corner of New Mexico to El Paso, Tex. The dusty, desert-like country traversed is sufficient to test the stamina not only of the men engaged but also the machines, according to information furnished by Fusion Welding Corporation, Chicago.

Pipe is delivered by the A. O. Smith Corporation in 30-ft. lengths. Seven lengths are welded together simultaneously, the pipe being turned by tongs alongside the trench as the operation proceeds. The long sections are then joined by the bell hole method in which a hole is dug for the welder, and he works completely around the pipe as it rests stationary over the ditch.

Gas-engine driven welders (General Electric, Lincoln, and Fuzon) mounted on automobile trailers are used. A coated welding rod, the coating of which surrounds the arc with a stable and protecting atmosphere, has been specified.

Inspection is being handled by an independent firm of engineers. The inspectors took into the field two portable milling machines to cut a sample from selected joints, and a tensile testing machine for determining the strength of these samples.

Engineers' First Welfare Medal to Be Awarded

Some time this year the American Association of Engineers is to make its first presentation of the Clausen Medal—the first engineers' welfare medal—which is to be awarded annually to the person (engineer or otherwise) who performs the most distinguished service for the welfare of the engineer—social or economic, or both.

H. A. Wagner, a national director of the association, sponsored the movement which authorized the annual award. This year's recipient is to be determined by a committee of the following engineers and industrial leaders:

G. M. Butler, dean and director of engineering, University of Arizona.

L. W. Baldwin, president, Missouri Pacific Lines.

J. W. Thomas, vice-president, Firestone Tire & Rubber Co.

C. F. Kettering, general director, research laboratories, General Motors Corporation.

Rufus B. von Kleinsmid, president, University of Southern California.

Michael J. Pupin, professor, research laboratory, department of physics, Columbia University.

Arthur E. Morgan, president, Antioch College.

W. L. Saunders, chairman, Ingersoll-Rand Co., New York.

George C. Warren, chairman of the executive committee, Warren Brothers Co., Boston.

A. N. Talbot, professor emeritus, College of Engineering, University of Illinois.

The medal is named in compliment to Henry W. Clausen, Chicago, who has given the American Association of Engineers commendable service for the past 15 years, as officer, director, committee chairman and national treasurer. The medal bears this inscription: "Awarded in recognition of a signal public service. Designed to mark the entrance of the American Association of Engineers into the field of welfare."

Bethlehem Steel Stock Plan Is Approved

Stockholders of the Bethlehem Steel Corporation, at a meeting in Newark, N. J., on May 29, approved the plan agreed upon by the directors on April 25 to increase the authorized common shares from 2,700,000 of $100 par value to 5,000,000 of no par value. Stockholders have the right to subscribe for 600,000 shares to be issued now at $85 a share in the ratio of one new share for every three shares held.

Sale of the 600,000 shares will provide Bethlehem with $51,000,000 new capital, which will be used for plant expansion.

President Eugene G. Grace told the stockholders at the Newark meeting that the company's second quarter earnings will be at least as large as those in the first quarter, when the amount earned on the common stock was $4.05 a share.

"June should do virtually as well as April and May in steel plant operations," Mr. Grace said. "There probably will be some recession, but not to the same extent as in past years."

Carnegie Steel Co. Low on Steel for Navy Ships

WASHINGTON, June 4.—The Carnegie Steel Co. was awarded the contract to supply 1326 tons of ordinary plates for reconditioning the battleship Arizona, its bid being 2.18c., Norfolk. The Pittsburgh-Norfolk rate is 38c. per 100 lb. The Carnegie company also was the lowest bidder on the other steel requirements for the Arizona, which have not as yet been awarded by the Bureau of Supplies and Accounts, Navy Department. These requirements, and the Carnegie quotations, delivered Norfolk, are: 218 tons of shapes, 2.28c. and 2.43c., and 1141 tons of special treatment plates, 12.88c. and 14.93c. Similar requirements will be necessary for reconditioning the battleship Pennsylvania and bids will be invited soon.

The Navy Department will receive bids tomorrow for construction of five of the 15 cruisers included in the naval program. Each ship will require 4700 tons of plates and 1350 tons of shapes. Two of the five vessels will be built in private yards and the remaining three in Navy yards. As stated in THE IRON AGE of April 18, page 1125, some of the material will be of exceptional dimensions as to length and width. Each ship will require 340 tons of galvanized plates and shapes.

Overall Length Standard for Bolts

At a meeting of the Bolt, Nut and Rivet Manufacturers' Association, held in Washington May 23, a resolution was unanimously adopted that the measurement of the length of all bolts be made from the largest diameter of the bearing surface under the head to the extreme end of the point. This means that in the case of countersunk head, deck and elevator bolts the overall dimension prevails.

Less Coal in Industrial Stock Piles

Industrial stocks of coal on May 1, as estimated by the National Association of Purchasing Agents, were 33,468,000 net tons, a reduction of almost 6 per cent from the 35,385,000 tons on April 1. The figure given is the lowest in much more than a year. There has been a steady reduction since Jan. 1, when the total was 41,492,000 tons. On May 1, 1928, it was 43,670,000 tons.

At the existing rate of consumption, stocks of bituminous coal on May 1, this year, were estimated as being equivalent to about 25 days' supply for industry at large. Among different industries supplies represented 19 days for by-product coke plants, 51 days for electric utilities and coal gas plants, 24 days for the steel mills and 24 days for railroads.

More Electric Power Made by Water in April

Production of electric power by public utility power plants in the United States in April is reported by the Geological Survey at 7874 millions of kwhr. This is a reduction of nearly 1½ per cent from the March total of 7984, but is well ahead of the February total of 7429. Much more of the April output was made by the use of water-power than in March or February. In April the water-power aggregate was 3280, or 41.2 per cent of all; in March it was 3146, or 39½ per cent; in February it was 2442, or 33 per cent.

Chromite Production Not Large in 1928

Shipments of chromite in 1928, according to the United States Bureau of Mines, amounted to 214 gross tons of ore containing 45 per cent or more of chromic oxide and 446 tons of ore containing between 40 and 45 per cent of chromic oxide, a total of 660 tons, valued at $14,807.

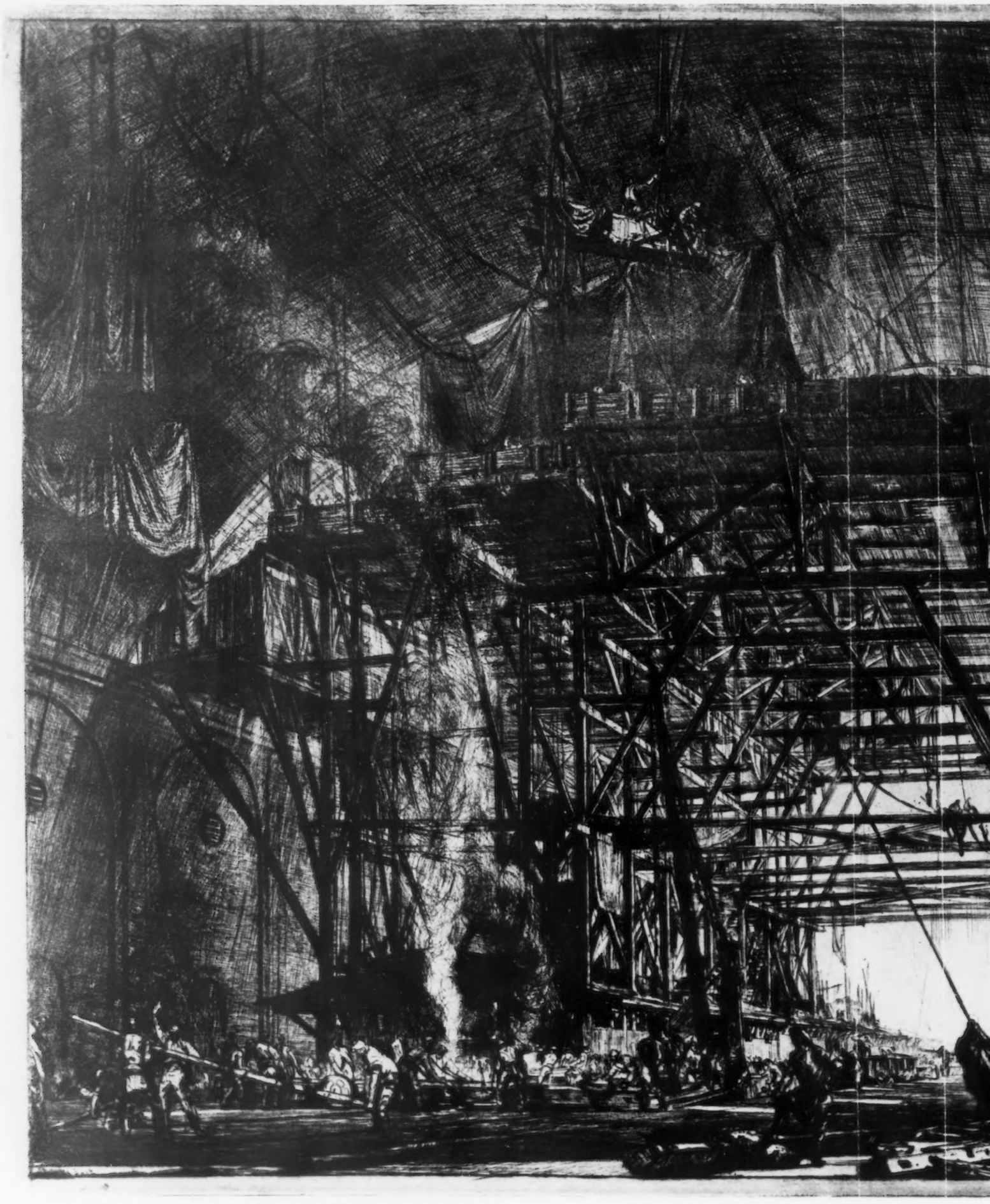
Imports of chromite were 216,592 tons in 1928, compared with 222,360 tons in 1927. They were principally from Rhodesia, Cuba, British India, Greece and New Caledonia.

Petroleum Production Smaller in April

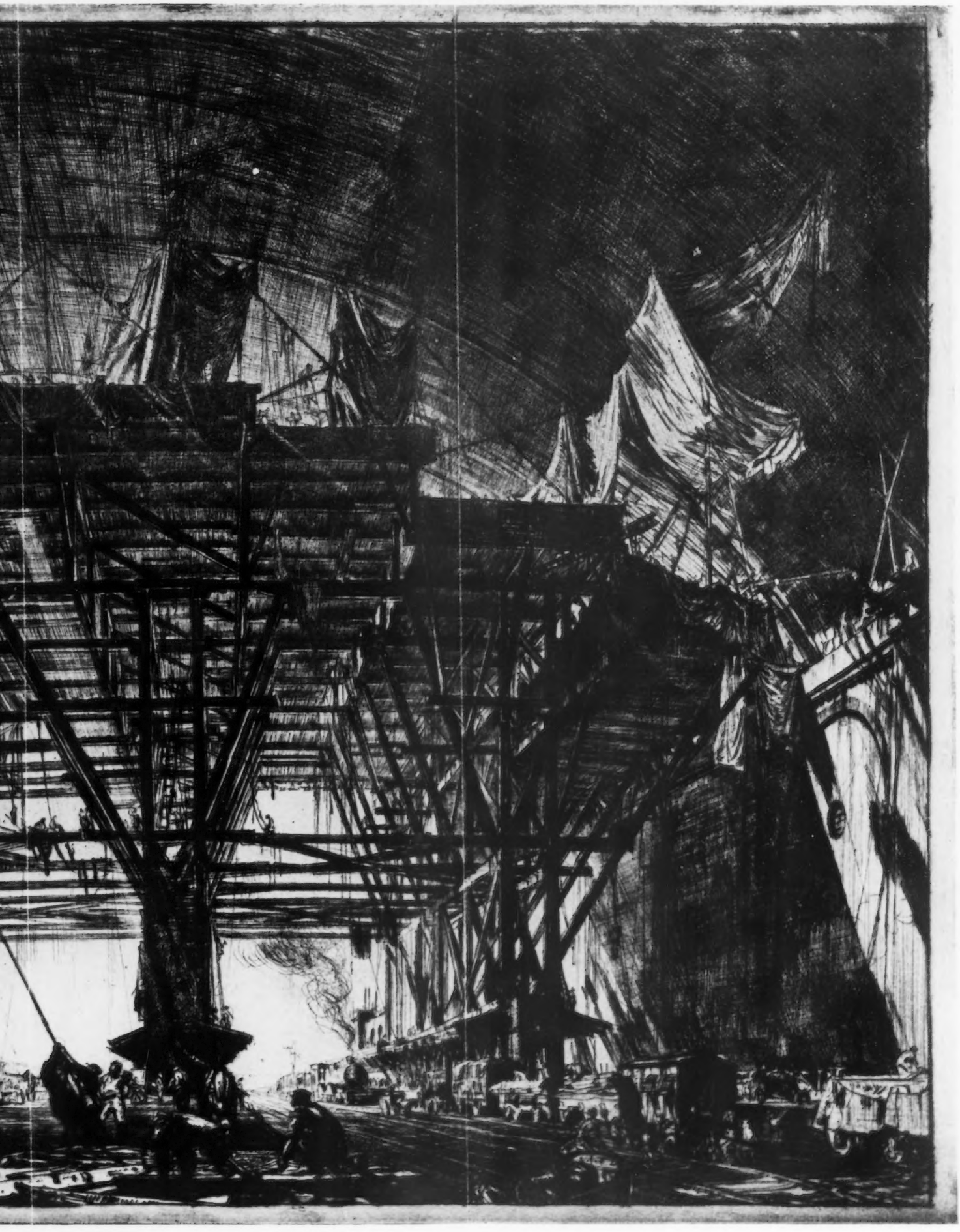
United States production of crude petroleum in April showed a drop of about 3 per cent from the March output, but was considerably higher than that for April last year, according to the Bureau of Mines. The aggregate is given as 80,110,000 bbl., compared with 82,515,000 bbl. in March and with 72,127,000 bbl. in April, 1928. For the four elapsed months production this year was 320,297,000 bbl., compared with 287,820,000 bbl. last year, representing a gain of almost 11½ per cent. This gain was nearly all in the light grades, which went up from 255,882,000 bbl. to 288,067,000 bbl., or 12½ per cent.

The United States Shipping Board, Washington, has authorized the sale of eight Lake-type vessels to the Boston Iron & Metal Co., Baltimore, with the understanding that they be scrapped.

Track Specialties Co., 29 Broadway, New York, has appointed the Hopkins Co., Marquette Building, Chicago, as its representative in the Chicago territory.



"GREAT GANTI
ETCHED BY MUIRHEA
Reproduced in THE IRON AGE by courtesy of W. S. Pilling, Pilling



GANTRY"

MUIRHEAD BONE

Pilling, Pilling & Co., Franklin Trust Building, Philadelphia

Protest Southern Pig Iron Rate Reduction

Northern Makers and Trunk Line Railroads File Objections With Interstate Commerce Commission

WASHINGTON, June 4.—Railroads serving blast furnaces in the South have filed tariffs with the Interstate Commerce Commission proposing reductions in rates on pig iron from those furnaces. The tariffs have been filed to become effective June 13, but have met with protest, especially vigorous in the case of those proposing lower rates from Birmingham and other Southern producing points to St. Louis and intermediate points in Illinois, Iowa and Indiana. Indicative of this tariff is the proposal to reduce the rate 73c. to $3.69 from $4.42 per gross ton from Birmingham to St. Louis. The other tariff would reduce pig iron rates from Southern furnaces to South Atlantic and Gulf ports. In both instances the railroads cite overproduction of pig iron in the South as the reason for their action.

Protests have come from the Youngstown Sheet & Tube Co., M. A. Hanna & Co., the St. Louis Gas & Coke Corporation, the Zenith Furnace Co., Duluth, Minn., and from the Central Freight Association, Illinois Freight Association and Western Trunk lines. These railroads have declared that they will be compelled to make like reductions from Northern furnace points if the tariff of the Southern lines becomes operative.

Say South Can Meet Competition

The Youngstown Sheet & Tube Co. said that Southern pig iron producers are well able to meet the competition of the Northern furnaces at St. Louis and the intermediate points when it is known that their published base price on No. 2 pig iron is $15 at the furnaces, which, plus the present freight rate of $4.42, makes a delivered price of $19.42 per gross ton at St. Louis, while the nearest competitor at Granite City, Ill., has a published base price on No. 2 iron of $20 at the furnace, which, plus switching charges up to 75c. per ton, makes an average delivered price well in excess of the present delivered price of the Southern producers. It was stated that "it is self-evident that if the freight rate from the South is further reduced 73c. per ton it will place an undue burden on the local producer as well as on all other producers in the North in meeting the competition of the Southern furnaces." The Youngstown company said further that its interests will be adversely affected not only by the proposed rate to St. Louis, but also by the rates which may be established at points intermediate to and beyond St. Louis and East St. Louis on traffic moving from Birmingham, for the reason that such rates may be made effective on one day's notice.

The protests of the Zenith Furnace Co. and the Hanna company are similar to that of the Youngstown company. The St. Louis Gas & Coke Corporation, Granite City, Ill., attacked the proposed rates as being unreasonably low. It was pointed out that over the routes from Birmingham to St. Louis the yield, on the average, would be only 5.9 mills per ton-mile and that the $3.69 rate would be lower than the railroads had proposed in one Southern pig iron rate case, which the commission held to be unjustified. It was added that the proposed rates are lower than those permitted by the commission in another case.

Louisville, Ky., Protests

The Louisville Board of Trade, in its protest, maintained that the reduction from Birmingham to St. Louis without a corresponding reduction to Louisville would have the effect of narrowing the present spread of $1.03 to 30c. a ton. Heretofore, it was stated, the carriers serving the Ohio River crossings from the South have insisted that the same relative revision be made to Louisville and other Ohio River crossings as to St. Louis.

Present and Proposed Rates in Gross Tons on Pig Iron from Birmingham

To	Present Rate From Birmingham	Proposed Rate to Birmingham, Based on St. Louis, East St. Louis Combination	Present Rate From St. Louis, East St. Louis	Amount of Reduction
Bloomington, Ill....	$5.89	$5.46	$1.77	.43
Chicago	6.01	5.85	2.16	.16
Decatur, Ill.....	5.76	5.20	1.51	.56
Kewanee, Ill.....	5.89	5.45	1.76	.44
Peoria, Ill.....	5.89	5.45	1.76	.44
Quincy, Ill.....	5.53	5.45	1.76	.08
Rock Island, Ill....	6.01	5.45	1.76	.56
Marshalltown, Iowa.	7.92	7.44	3.75	.48

The Mobile (Ala.) Chamber of Commerce and the Alabama State Docks Commission have protested against the proposed reductions in rates on pig iron to South Atlantic and Gulf ports. The Mobile chamber alleged that the reduced rates would be unduly prejudicial against Mobile and unduly preferential of Charleston, S. C., Savannah and Brunswick, Ga., Jacksonville, Fla., Norfolk, Pinners Point and Portsmouth, Va. The request is for suspension only in so far as the proposed rates would apply to traffic going to the Pacific Coast ports. The petition said that an analysis shows that from Birmingham on Pacific Coast traffic the present difference, Mobile under South Atlantic ports is 62c. ($3.37-$2.75); under Virginia ports, $1.50 ($4.25-$2.75); from Chattanooga, Tenn., the present difference under Virginia points is 63c. ($4-$3.37); to South Atlantic ports, the rates are the same as to Mobile ($3.37). The report says that Birmingham and Chattanooga are typical furnace points in the Alabama and Tennessee districts. The petition says:

"The June 13 rates from Birmingham would make the difference, Mobile under South Atlantic ports, 25c. ($2.70-$2.45); under Virginia points, $1.05 ($3.50-$2.45), thus decreasing Mobile's spread under South Atlantic ports 37c. (62c.-25c.); under Virginia ports, 45c. ($1.50-$1.05); from Chattanooga, Mobile will be 37c. over the South Atlantic ports ($3.07-$2.70) and 18c. under Virginia ports ($3.25-$3.07).

"Under normal conditions the ocean rates are the same from Mobile, South Atlantic and Virginia ports to Pacific Coast ports. The outbound tonnage from South Atlantic ports is substantially less than the inbound tonnage, while the outbound tonnage from Mobile is substantially greater than the inbound tonnage. On this account, distress rates would be more readily available at South Atlantic ports than at Mobile, and the petitioners are apprehensive that any decrease in Mobile's spread would divert the traffic to those competing ports."

New York Steel Treaters Elect Officers

At the regular May meeting of the New York chapter of the American Society for Steel Treating on Monday, May 20, the following officers were elected for the ensuing year: Chairman, Edgar C. Bain, research metallurgist, United States Steel Corporation, Kearny, N. J.; vice-chairman, Edwin F. Cone, associate editor of THE IRON AGE, New York; secretary-treasurer, T. N. Holden, Jr., chief chemist, E. W. Bliss Co., Brooklyn.

The following were chosen as the executive committee:

H. A. Anderson, Bell Telephone Laboratories; E. H. Anthes, Bausch & Lomb Optical Co.; J. G. Bell, Central Alloy Steel Corporation; J. J. Crowe, Air Reduction Sales Corporation; C. O. Fairchild, C. J. Tagliabue Mfg. Co.; William Prentz, Wilson-Maeulen Co.; J. S. Varrick, International Nickel Co., and R. G. Waltenberg, H. A. Wilson Co.

A new educational motion picture portraying the construction of arc welded pipe lines has been released by the Lincoln Electric Co., Cleveland. Beginning with the arrival of the pipe from the manufacturers the motion picture shows each successive step in the construction of pipe lines until completion illustrating the latest and most modern methods that are employed on the major arc welded pipe lines that are now under construction. The film is offered gratis for exhibition upon application to the company.

Competitive examinations for a mechanical engineer to serve as chief of mechanical service in the Federal Penitentiary organization are announced by the Civil Service Commission. Closing date is June 19. Entrance salary is $3,800 a year. Full information may be obtained from the Civil Service Commission, Washington, or at the post office or customs house in any city.

Greater Confidence in Steel Abroad

Better Feeling in Britain, Larger Exports from Germany, Higher Production in Russia—Cartels to the Fore Again

(*By Cable*)

LONDON, ENGLAND, June 3.

IRON and steel business has been affected by the political situation, but the tone of business is confident, in spite of the defeat of the protectionists, and improvement in trade is expected to continue.

Scarcity of Cleveland pig iron is still acute and makers are not accepting new orders as they are sold out for four months. Most consumers, however, are already well covered.

Increased output of pig iron is hampered by the ore shortage, but two Cleveland ironstone mines are scheduled to resume operation soon. Hematite demand is well maintained, consumers purchasing in anticipation of a price increase.

Finished steel consumers covered their requirements before the latest price advance and are now quiet. In general the mills rolling heavy material are better engaged and plate output is to be increased by the South Durham Steel & Iron Co., Ltd., resuming operation of its Stockton mill.

Export business is quiet, but inquiry is improving. Foreign iron and steel business with British consumers is quiet, but shipments on old contracts are still arriving. New business has been slow, because of the uncertain political situation. Continental works are reported to be in need of semi-finished steel orders, but are unwilling to grant large concessions.

Tin plate is quiet but the market is steady, with makers well sold ahead and world demand expanding. The National Food Canning Council is planning further packing developments here. A large pea and vegetable factory is to be started by the end of June and a new fish packing plant later.

Galvanized sheets are quiet, but the tone of the market is steady. Japanese demand for light-gage black sheets is slack.

Directors of Dorman, Long & Co. and Bolckow, Vaughan & Co. state that no agreement has yet been reached on a merger and negotiations have been temporarily suspended.

Clyde shipbuilding in May was 24 vessels of 45,000 tons. The International Rail Makers' Association meets in Paris, June 19, when prices are expected to be advanced 2s. 6d. (60c.) a ton and an effort will be made to include tram and light rails under control of the association.

German Export Improves—Large Machinery Orders

(*By Radio*)

BERLIN, GERMANY, June 3.

Export business in pig iron and semi-finished material is active and prices are quite firm. Demand for sheets is also improving, but export of steel bars is less satisfactory and prices show a tendency to decline. The German Wire Syndicate has reduced export prices by 2s. 6d. to 5s. (60c. to $1.20) per ton.

Machinery builders are increasingly active as a result of some of the heaviest export orders in recent years.

Domestic prices of all syndicates are unchanged for June. The home market for pig iron is dull and bar prices are weak. Business in semi-finished material, steel bands and wire rods is satisfactory and improvement is reported in orders for gas and boiler tubes.

The Iron Founders Association has advanced all prices 4 per cent, effective June 1.

British and Continental European prices per gross ton, except where otherwise stated, f.o.b. makers' works with American equivalent figured at $4.85 per £ as follows:

Durham coke, del'd	£0	18½s.	to	£0	19s.	$4.48	to $4.60
Bilbao Rubio ore*	1	3				6.18	
Cleveland No. 1 foundry	3	11				17.21	
Cleveland No. 3 foundry	3	10				16.97	
Cleveland No. 4 foundry	3	7½				16.37	
Cleveland No. 4 forge	3	7				16.25	
Cleveland basic (nom.)	3	7½				16.37	
East Coast mixed	3	13½				17.70	
East Coast hematite	3	14				17.94	
Rails, 60 lb. and up	7	15	to	8	15	37.59	to 42.43
Billets	6	7½	to	6	10	30.91	to 31.52
Ferromanganese	13	15				66.69	
Ferromanganese (export)	14	0				67.90	
Sheet and tin plate bars, Welsh	6	5	to	6	7½	30.31	to 30.91
Tin plate, base box	0	18⅛	to	0	18¾	4.45	to 4.53
Black sheets, Japanese specifications	13	5				64.26	
						C. per Lb.	
Ship plates	7	12½	to	8	2½	1.66	to 1.76
Boiler plates	9	0	to	10	10	1.95	to 2.27
Tees	8	2½	to	8	12½	1.76	to 1.86
Channels	7	7½	to	7	17½	1.60	to 1.71
Beams	7	2½	to	7	12½	1.55	to 1.65
Round bars, ¾ to 3 in.	7	12½	to	8	2½	1.65	to 1.76
Steel hoops	9	0	to	10	0	1.95	to 2.16
Black sheets, 24 gage	10	5	to	10	10	2.21	to 2.27
Galv. sheets, 24 gage	13	12½	to	13	15¾	2.94	to 2.98
Cold rolled steel strip, 20 gage (nom.)	12	0				2.64	

*Ex-ship, Tees, nominal.

Continental Prices F.O.B. Antwerp or Hamburg

Foundry iron, 2.50 to 3.00 per cent sil., 0.50 to 0.90 per cent phos.	£3	7½s.	to £3	12s.	$16.37	to $17.45
Foundry iron, 2.50 to 3.00 per cent sil., 1.00 per cent and more phos.	3	12			17.45	
Billets, Thomas	5	4	to 5	7	25.22	to 25.94
Sheet bars, Thomas	5	8			26.19	
Wire rods Low C., No. 5 B.W.G.	6	5	to 6	6¼	30.31	to 30.61
Black sheets, No. 31 gage, Japanese	12	10			60.62	
Rails, 60 lb. and heavier	6	10*			31.52	
Rails, light	6	0			29.10	
					C. per Lb.	
Steel bars, merchant	5	18	to 6	0	1.28	to 1.29
Steel bars, deformed	5	17	to 5	17½	1.27	to 1.28
Beams, Thomas, British standard	5	6	to 5	6½	1.14	to 1.15
Channels, Thomas, American sections	6	1			1.31	
Angles, Thomas, 4-in. and larger, over ⅜-in. thick	5	10			1.15	
Angles, Thomas, 3-in.	5	14			1.23	
Ship plates, open-hearth, inspected	7	10			1.62	
Hoop and strip steel, over 6-in. base	6	7½			1.38	
Wire, plain, No. 8 gage	7	11½			1.67	
Wire, galvanized, No. 8 gage	9	9	to 9	12½	2.05	to 2.12
Wire, barbed, 4-pt. No. 12 B.W.G.	11	19			2.58	
Wire nails, base	7	19			$1.72 per keg	
Wire nails, assortments, 1 to 6-in. keg	10	9			2.26	

*Open-hearth steel, 7½s. ($1.82) per ton extra.

Russian Steel Output Improves

Production Still Under Program for Year—Machinery Plants and New Tractor Works Planned

MOSCOW, RUSSIA, May 21.—Production of pig iron, ingot steel and rolled products shows a steady upward trend. In the first half of the current business year, from Oct. 1, 1928, to March 31, 1929, pig iron output was 1,877,000 metric tons, compared with 1,622,000 tons in the first half of the business year 1927-1928. Steel ingot production was 2,314,000 tons, compared with 2,109,000 tons in the first half of the previous year, and output of rolled products was 1,874,000 tons, compared with 1,702,000 tons.

Although pig iron production showed a greater increase in the first half of this year than output of either steel ingots or rolled products, the total was slightly below the rate called for by the year's program of 3,884,000 tons. However, the new Kertch Smelting Works in the Crimea began production April 20, with an output of 250 tons a day, and two other blast furnaces with a capacity of 375 tons a day each are being completed.

The Contract Commission of the Dnieperstroi, the electric power development on the Dnieper River, lately returned from Central European countries and announced that a contract has been awarded the Witkowitzer Bergbau und Eisenhütten Gewerkschaft, Witkowitz, Czechoslovakia, for a single-span bridge over the Old Dnieper River and for special sections for a bridge over the New Dnieper River. A five-year credit was obtained by the commission.

Director Barsky of the Construction Committee, Supreme Council of Economy, states that contracts for factory equipment have recently been awarded to German companies, which quoted prices about 12 per cent lower than a year ago. The committee has engaged 50 German, Austrian and Belgian engineers for construction work.

The Glavmaschstroi, machine construction board, has approved a program for the erection and equipment of 38 machinery plants at a total cost of 666,000,000 rubles. Of the total, about 380,000,000 rubles will be expended in the business year 1929-1930. Miscellaneous machinery will be built in 24 of these plants, agricultural machinery in five and small metal products in six. The Glavmaschstroi has approved a proposal to erect a tractor plant for the Ural district,to cost 63,000,000 rubles. It has recommended construction of a plant for building 3-ton motor trucks.

Germans Want Larger Cartel Quota

Will Also Urge International Syndicate to Abolish Export Control—Propose British and Polish Membership

BERLIN, GERMANY, May 18. — The German program in the coming negotiations for prolongation of the International Steel Cartel is not yet definitely known, but an informal meeting of steel producers in Upper Silesia, May 16 and 17, included representatives of the Rohstahlgemeinschaft, Stahlwerksverband and subordinate syndicates. Leading steel men, including Thyssen, Kloeckner, Poensgen and Frick, were present.

Germany has long urged that Great Britain and Poland should join the cartel; and in some quarters it is suggested that German delegates to the coming international meeting should make such adhesion a leading point in their program. It is stated that Germany can have little interest in the cartel unless these two important non-members join.

It is further suggested that Germany's program should include a demand for an increase of its quota of 43.18 per cent and abolition of restrictions on export. At present German export trade is limited to 330,000 tons a month. The German steel industry also insists that the International Steel Cartel shall proceed with the creation of selling syndicates for various products, particularly semi-finished material, bars and shapes. Only through such syndicates, it is argued, can wide fluctuations in the world market prices be prevented. Stability of prices in the German domestic market resulted immediately after the establishment of home selling syndicates.

Since the International Steel Cartel was established, price advances in the Continental market have repeatedly been followed by sharp reductions, as a result of pressure for export trade regardless of price. On such transactions France and Belgium, having lower production costs than Germany, have sustained little or no loss, but Germany has suffered materially, even when selling at slightly higher prices. So far France and Belgium have formed no domestic selling syndicates, which are prerequisite to the organization of international cartels.

Renewal of the German home syndicates, which expire this year or in 1930, is still in doubt. The Vereinigte Stahlwerke A. G., Düsseldorf, still adheres to its view that if all syndicates cannot be renewed it is useless to prolong any of them. The greatest difficulty is likely to be encountered in renewing the German Tube Syndicate and the "A" Products Syndicate, which controls semi-finished products, structural shapes and rails.

To Advertise Open-Hearth Steel Abroad

HAMBURG, GERMANY, May 20.—Producers of Siemens-Martin (open-hearth) steel in Germany are preparing to advertise more extensively in foreign markets in an effort to increase exports. Germany is the leading Continental producer of Siemens-Martin steel, but exports have not been so large as shipments of Thomas quality, except in ship plates and bridge material. The mills believe that publicity abroad will result in increased trade in bolt and rivet bars, cold-rolled hoops and certain qualities of sheets, as well as structural shapes, of open-hearth steel. Booklets, now being prepared, together with material for use in local advertising of the merits of open-hearth material, will be sent to agents in foreign markets.

German Domestic Pig Iron Prices Advanced

BERLIN, GERMANY, May 22.—New domestic prices established by the German Pig Iron Syndicate, as of May 15, are: No. 1 foundry iron, formerly 86.50 m. ($20.61) per metric ton, advanced to 88.50 m. ($21.09) per ton; No. 3 foundry iron, formerly 82 m. ($19.54) per ton, now 85 m. ($20.25) per ton; hematite iron, formerly 87.50 m. ($20.85), now 91 m. ($21.69); Siegerland steel-making iron, formerly 85 m. ($20.25), now 88 m. ($20.97); spiegeleisen, 10 to 12 per cent, formerly 109 m. ($25.97) per ton, and now 112 m. ($26.69) per ton.

Fairly Active Steel Market in Germany

BERLIN, GERMANY, May 18.—Demand for iron and steel from machinery builders has increased. Building construction is still hampered by high money rates. Semi-finished material is in active demand, especially for export, but business in iron and steel bars is dull. The export price for heavy-gage sheets has declined 1s. (24c.) a ton, and the upward movement of slab prices has ceased, following some heavy buying by British consumers.

The German Wire Syndicate has reported satisfactory export business, although keen competition from Belgium is encountered. In both Belgium and France, domestic business in heavy products is slackening and producers are seeking to increase exports by shading prices. Sellers view future market conditions with optimism, expecting increased business with eastern Asia. In some quarters, however, it is predicted that Japan's

demand for semi-finished products, which has been largely met by Germany and Belgium, will be increasingly supplied from Japanese domestic production and the United States.

German Makers of Steel for Bearings Form Cartel

DÜSSELDORF, GERMANY, May 20.—A syndicate of manufacturers of steel for bearings has been formed, under the name Kugellager Stahlverband G. m. b. H., to function as a subsidiary syndicate of the Edelstahl Verband. Members of the new syndicate include the Stahlwerke Roechling-Buderus, the Silesia Stahlwerke, the Deutsche Edelstahlwerke and the Stahlwerk Becker. The new cartel will control the sale of the entire production of bearing steel.

It is also reported that an agreement has been negotiated between the S. K. F., Norma A. G., of Stuttgart and Berlin, and the German makers of bearings, Fichtel und Sachs and Fries und Hopflinger, both of Schweinfurt.

Mannesmann Company Blows in New Furnace

BERLIN, GERMANY, May 18.—The first of the two new blast furnaces built by the Mannesmann Tube Co. at Huckingen is now in service and the second will be blown in shortly. Preparations are also being made to place in operation the new Huckingen Steel Works, which will make the Mannesmann company entirely independent of outside sources of supply for semi-finished material.

Friedrich Krupp A.G., Essen, has just lighted a new blast furnace at Borbeck. The Mannesmann company has been negotiating with the Krupp interests to induce them to abandon plans to establish a new tube works with a proposed capacity of 150,000 tons a year, but without effect.

German Mannesmann Tube Co. shares have been exchanged with British Mannesmann Tube Co. shares, with the result that the German corporation now controls about 93 per cent of the capital stock of the British corporation.

Rail Association Expected to Advance Prices

HAMBURG, GERMANY, May 20.—Representatives of members of the International Rail Makers' Association will meet in Paris, June 19, and it is generally expected that prices of rails will be advanced. Both the British and German members of the association are prepared to urge an increase, and other members are not expected to offer much opposition. The increase is not likely to exceed 2s. 6d. (60c.) a ton for Thomas grade and 3s. (72c.) a ton for open-hearth rails. Placing tram rails under the control of the association will also be discussed.

European Mills May Reduce Billets for Japan

HAMBURG, GERMANY, May 20.—A report from the United States that Japan had placed 25,000 tons of sheet bars with American mills and a similar report from Japan that an order for a total of about 10,000 tons of billets had been distributed among American mills have caused something of a sensation among European producers of semi-finished material. As American shipments of semi-finished steel to Japan are usually unimportant, Continental makers are much concerned over these developments, as Japan is one of their leading markets for crude steel. It is now suggested that quotations on billets and sheet bars for Japan be reduced 1s. to 1s. 6d. (24c. to 36c.) per ton below the market on semi-finished steel for the United Kingdom.

Metallurgical Congress in Germany

The Institute of Metals (Great Britain) will hold a meeting at Düsseldorf, Germany, Sept. 9 to 12. It will be the first meeting of the institute in Germany. It is the result of an invitation from the Verein Deutscher Ingenieure and the Deutsche Gesellschaft für Metallkunde. In addition to the presentation and discussion of papers by members of many nationalities, visits to works as well as gatherings of a social character will be provided.

Poland Sells Light-Gage Black Sheets to Japan

HAMBURG, GERMANY, May 20.—Polish steel producers have recently appeared as competitors for Japanese business, especially in light-gage black sheets. Although total Polish steel exports are only 4000 to 6000 tons a month (in March 5380 tons), shipments to Japan are about 1000 tons a month. Most of the steel exported to Japan consists of tubes, but recently there has been an increasing tonnage of Nos. 28 and 30 gage black sheets. So far this year Poland has shipped an average of 370 tons of black sheets a month to Japan. The Polish steel industry receives an export subsidy of 2.50 zlotys (28c.) per 100 kg. on tubes, and it is expected that a subsidy will also be paid on black sheets and other steel products.

Norton Co. Appoints European Manager

The Norton Co., Worcester, Mass., has created the office of European manager for the purpose of supervising and coordinating the company's work in the European countries. The office will be filled by Herbert A. Stanton, credit manager and assistant treasurer, who will enter upon his new duties in July. His headquarters will be in London, from which city he will travel extensively on the Continent. The management and operating forces of the company's works at Wesseling, Germany, La Courneuve, France, will remain unchanged, according to the announcement made by Willian La Coste Neilson, vice-president and sales manager. Mr. Stanton has been credit manager of the company since 1912, and was made an assistant treasurer 10 years ago. Previously he was engaged in credit work for the Brown-Durrel Co. of Boston.

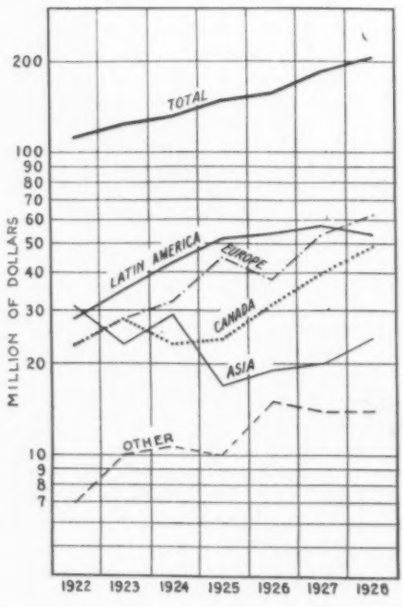
The Broderick & Bascom Rope Co., St. Louis, has appointed the Wells Fargo & Co. Express, S. A., as its distributer for the sale of wire rope in Mexico.

Europe Takes Largest Share of Machinery Exports

TWO most gratifying increases in purchases of American industrial machinery are those which have been made by Canada and Europe. Both of these sections have fairly large machinery producing industries. In the face of this, American manufacturers exporting to these territories have been able to increase their business considerably.

Another market which has shown a decided improvement is Asia. Business there for the last few years has been exceedingly dull. But it now looks as though an improvement had set in and that American machinery and the question of quality and design were beginning to play an important factor in the thoughts of consumers in that territory.

Detailed figures are shown in a report by R. G. Matthews of the Industrial Machinery Division, Department of Commerce, from which the above and the diagram at right were taken.



This Issue in Brief

Casting costs can oftentimes be cut by use of ram-up cores. If properly made, they eliminate the necessity for nails, wire and chaplets, and in many cases prevent cuts, scales, dropouts and swells. —Page 1549.

* * *

Heating by radiation maintains even temperature of tin bath. Gas burners impinge on bed of broken refractory, which heats tin pots. Molten tin and palm oil are in the same pot, divided by an apron, reaching part way down from the top. Sheets pass through the tin and up through the oil.—Page 1552.

* * *

For cadmium plating in cyanide bath, nickel is the best brightener, says research chemist. It gives a brighter, smoother, more ductile and apparently harder deposit, and may be introduced in the form of any compound soluble in an excess of sodium cyanide.—Page 1574.

* * *

Long life for silica brick is assured if they are kept always above a dull red heat. They will then withstand violent temperature changes without spalling. Avoid heating them too rapidly from the cold condition.—Page 1556.

* * *

Noise killer helps increase production. Acoustic felt applied to factory office walls and ceilings absorbs 80 per cent of noise. The reduction of noise improves working conditions and keeps down labor turnover.—Page 1558.

* * *

Poorly burned brick is partly responsible for carbon deposits in upper part of blast furnace. Burning the brick eliminates elements which act as catalysts in producing carbon monoxide.—Page 1568.

When hardening steel parts by nitriding, the extent of ammonia dissociation during the operation can be determined by the use of a special pipette. If reading shows that 30 per cent of ammonia has been dissociated, gas flow should be increased—Page 1564.

* * *

Heat loss can be reduced 45 per cent in an uninsulated open-hearth regenerative chamber with a 13½-in. roof by increasing roof thickness and insulating properly. —Page 1559.

* * *

Accuses American industry of inertia. "Normal state is inertia," says speaker at A. S. M. E. meeting. Government hampers progress by insisting on a period of 20 years in obsolescence allowances, whereas much equipment should be written off in one to two years in rapidly changing processes.—Page 1565.

* * *

Better steel at lower cost made in large open-hearth furnaces, says open-hearth man. Oxidation in deeper bath is not quite so extensive, less bottom trouble, and bottom cleans better.—Page 1567.

* * *

Tungsten carbide cutting tools are not adaptable to jobbing work, or to short runs, or to work requiring the smoothest finish. For the present their use is limited to tools of simple shape, such as used in lathe and planer. —Page 1592.

* * *

No pinion stands in drive of new continuous rolling mill. Three work stands of light trussed joist mill are driven directly through a combination of bevel and back gears.—Page 1570.

In chromium plating baths, most important factor is ratio of chromic acid to sulphate, says chemical engineer. Proper quantity of either sulphuric or chromic acid to be added may be rapidly determined without making a quantitative analysis of the solution for sulphate.—Page 1574.

* * *

Fatigue limit of steel may be determined by measuring electrical resistance. Rotary bending machine for finding endurance limit quickly is developed by Japanese metallurgist. — Page 1572.

* * *

Finds little difference in soil corrosion rate of different kinds of ferrous metal pipe. Tests reveal a difference of only 12.7 per cent between commercially pure iron and wrought iron. Degree of rainfall and nature of soil are chief factors.—Page 1569.

* * *

When cupola is charged with scrap containing small quantities of tin, is the mixture harmfully affected? Five per cent tin lowered transverse strength from 3750 to 2350 lb., says a foundryman. Tin is absorbed and becomes a hardener, says metallurgist.—Page 1551.

* * *

Heat treatment not required after nitriding. Parts are subjected to action of ammonia gas at nitriding temperature for from 2 to 90 hr., depending on the service required. Parts are cooled in the box, usually at room temperature.—Page 1565.

* * *

New record in pig iron production. Average daily rate in May was 125,745 gross tons, highest ever achieved. Previous record month was May, 1923, with 124,764 tons. Number of furnaces in blast June 1 was 219, a gain of 4.—Page 1596.

A. I. FINDLEY
Editor

THE IRON AGE

W. W. MACON
Managing Editor

ESTABLISHED 1855

The Sphere of Carbide Tools

IN appraising such statements as that "The new tungsten carbide cutting tools are destined to revolutionize the machine tool industry," it is well to keep in mind one or two undoubted facts. The first is that revolutions do not occur over night, and the second is that nothing is perfect or universal in application.

Readers of history are liable to have their time-vision greatly foreshortened. For instance, in a few pages, taking less than an hour to read, will be recounted the events which preceded Bunker Hill and the signing of the Declaration of Independence. The American Revolution is so quickly summarized that the reader forgets the seven years of campaigning before victory at arms was won, and the 30 or more years of political consolidation before the United States could certainly be called a nation. We also speak glibly of the revolution in machinery production caused by high-speed steels. We think of it as having occurred rapidly, and speak of it as having been entirely completed. As a matter of fact, Frederick W. Taylor and Maunsel White worked at the problem of lathe tools for 26 years. The first tool heat-treated by their method was publicly exhibited in 1900; and a notable improvement in the metallurgy of high-speed steel was made as late as 1927. Here is a span of half a century since the inception of the idea. The revolution is not yet complete—in fact, high speeds are even now largely confined to mass production.

Such a parallel should not cause one to shut his eyes to those harder tools which cut very much faster; on the other hand, it will indicate that there is no need to throw all the present equipment on the scrap heap before the next inventory. If, in the years since the opening of this century, high-speed tools have not yet been able to eliminate their predecessors, the earlier types must be well enough intrenched to resist inroads from an even more specialized material like tungsten carbide.

These new carbide tools, while wonderful performers in certain roles, have their own limitations. This brings us to our second point—that the new tools are not universal tools, nor are they perfect. They are hard, but they are also brittle; they are so expensive that cutting tips must be brazed or welded to a cheaper steel shank and these joints are not always as good as they might be.

Such facts explain the varying experiences reported to date. Obviously the new tools are limited to mass production—runs numbered by thousands rather than dozens. Next, they are especially successful on work which high-speed steel has never been able to touch, such as brittle or hard non-metallic materials used in electrical equipment. They also work excellently on the soft, tough alloys of aluminum or copper which dull high-speed steels rapidly. For instance, a tungsten carbide tool turning lynite pistons will hardly ever need sharpening.

In the field of iron and steel there are some definite limitations. As pointed out before, the carbide tools are not adaptable to jobbing work, or to short runs, or to work requiring the smoothest finish. Until the tool manufacturing technique is much improved they are limited to tools of simple shape, such as those used on lathes and planers. And here, when working on the harder steels particularly, several experimenters have reported that the shock of entering the cut at rapid feed is sufficient to cause flaking of the tip. Not all tools are alike in this, however; it may well be one of the troubles the manufacturers will be able to solve.

It would appear that tungsten carbide tools are more likely to cause an extension of machine shop work into hitherto unoccupied fields than to cause a rapid revision in the whole tool line-up.

The Decline in Stocks

READERS of this journal have had plenty of warnings of the instability of the stock market, and the major decline that occurred lately should not have been any matter of consternation. If there is any wonder, it is at the delay of it.

We need not speculate about the part played by the discouragement of the Federal Reserve Board. High money rates and low dividend yields have conjunctively their own natural effect and the time comes always when there are more sellers than buyers and that invariably puts an end to a bull movement either in securities or commodities.

A good many stocks are now back to prices on which their dividends figure 5 to 6 per cent. If the maintenance of their dividends is reasonably assured, they are sound investments on such a basis. If there be good prospects of increase in their earning capacity and eventually in their dividend rates, while they sell temporarily on a 5 to 6 per cent basis, they are on the bargain counter. The same reasoning may be applied in reverse. Examination of the list will reveal some stocks that are now too low and some that are still too high, each way in different degree.

The recent extravagance in the upward movement in stocks did not reflect the ushering in of any new principles in speculative investment. At the most it

evinced a keener sense of what a growing business may do beyond what it is doing at the moment, immediate dividend yield being subordinate to the prospective. In the end, however, it all comes to the same thing.

Labor in the British Election

THE victory, or quasi victory, of the labor party in Great Britain is something of a shock, mainly in that it may introduce a government of relatively inexperienced men, many of whom are saturated with socialistic ideas. Dread on the latter score is tempered, however, by the reflection that all of the political parties of Great Britain, even the Conservative, have been growing more and more socialistic. The main difference has been that the Conservatives have been less reckless in their promises, having a more experienced foresight on the practicable and the impracticable. If Mr. MacDonald forms a ministry and is able to restrain his "wild men" probably the management of Great Britain will not become so bad as is feared.

Indeed, if Mr. MacDonald is in favor of improving Anglo-American relations, as he is supposed to be, he may accomplish a good deal of benefit. Many observers on both sides of the Atlantic have been viewing with grave concern the estrangement that has been developing, especially on the part of the British toward us, for except in Washington it is doubtful if we Americans have given much attention to the matter. Probably not many of us have taken serious thought of the sobriquet of Uncle Shylock that is applied to us collectively and has reference to the manner of our collecting the war debts to us.

We are not in this article discussing that unpleasant subject, but we may say that it is unfortunate that the British do not understand us and probably we do not understand them. Anyway, an Anglo-American unfriendliness is one of the worst things that can happen in the world.

Marketing Troubles in Coal

SELLERS of coal have been complaining still more about conditions in this unfortunate trade. As it is well known that industrial activity has been unusual and that year by year coal is being used more efficiently, one might fancy that the latter influence is enough stronger than the former to produce the poor market conditions. That is hardly the case. The trouble with coal is not in tonnage, relative to the past, but in price competition, which has grown increasingly strenuous.

There are sufficient data to check this matter. Anthracite is relatively steady and need not be considered. Bituminous production in five years, Jan. 1 to May 25, has been as follows:

	Net Tons
1925	192,761,000
1926	216,611,000
1927	232,544,000
1928	191,518,000
1929	207,744,000

The usual decrease in stocks of consumers during the nearly five months period is in the neighborhood of 6,000,000 tons, but in 1927 there was an increase of 20,000,000 tons in the first three months, in anticipation of the April 1 suspension. Making correction for this the average in the four years 1925-8 would be about 202,000,000 tons, while this year has shown about 6,000,000 tons gain. Hence the production of 1929 really has not been poor at all. As to exports, they amounted to 2,594,427 tons in three months of this year, about the same in 1928 and only slightly higher in the two preceding years. Changes in exports, therefore, do not count materially.

Much publicity has been given to the fact that in recent years the public utilities have increased greatly their economies in the use of coal. In 1919 they used 3.2 pounds per kilowatt hour; in 1925, 2.1 pounds and in 1928, 1.76 pounds. Their total coal consumption did not decrease, however, being 38,880,000 tons in 1919, 44,780,000 tons in 1925 and 46,434,000 tons in 1928. Certainly the coal industry has no complaint on that score. The trouble, if any, would be that of the increasing power production by the utilities being along the line of their selling to power users who formerly bought coal to produce power themselves. Year by year, however, industries are greatly increasing their use of power and that is a large if not a complete offset to their increasing economies.

Railroad consumption of coal decreased rather sharply in 1924, and since then it has been substantially steady, having lost not to exceed 2,000,000 tons in passenger service and a million tons in freight service. For the fraction of a year now being considered, with production of over 200,000,000 tons to May 25, this railroad loss is almost negligible.

As to general industrial activity, the figures of the Federal Reserve Board are comprehensive. The board's base, 100, for industrial production is the monthly average of 1923-4-5, and the sum of the indices for the first three months of the last five years has been as follows:

1925	316
1926	322
1927	328
1928	323
1929	352

This year, at 352, gained 9 per cent over the average of the four preceding years, 322, which is not a great deal, and coal production did show some gain.

Thus a reasonably clear case is made out that the troubles of the coal market are related to competition rather than to tonnage. It is strictly a buyer's market. One might have expected tonnage to increase sharply as it used to do. Economies have largely but not completely prevented that.

Price Swings and Prosperity

PERHAPS the economists put too much stress upon price trends in connection with prosperity and its opposite. Certainly they have shown no little disposition to criticize prices in the last few years for failing to advance when there was a great deal of prosperity. When an economist deals with statistics you cannot of course ask him to forget what has been, but it is not amiss to suggest that new principles should be considered, new ways of analyzing the figures.

An impressive exhibit was made about eight years ago by a price review showing that after the

Napoleonic wars (and our war of 1812) and after our Civil War, followed by the Franco-Prussian war, prices showed a general tendency to fall for a long time, something like thirty years. The subject came up just as we were completing a drastic reaction from the profiteering orgy of 1919-20 and not a few people were inclined to suspect that we should have more of the same for quite a period of years.

Nothing of the sort has occurred. The Bureau of Labor's commodity price index shows very little variation in the last eight years. Averaging the four years 1921-4 and the next four, 1925-8, we find the same general level within one per cent, and the very slight change shown is an increase.

Now, one is apt to become rather bearish on the future if he takes the premise that it is natural for prices to fall for two or three decades after a great war and the further premise that prosperity naturally means higher prices, for every one feels that we have had more prosperity in the last four years than in the preceding four. According to the premises, prices wanted to go down but were kept up by prosperity, which was equivalent to an advance. The conclusion would be that eventually prices would have to drop an extra amount to make up for the lost time.

As a matter of fact that is what some economists have been predicting. In connection with the reparations negotiations they have asserted that if there were failure the world would be plunged in trouble while success would do well if it preserved the *status quo*.

The awkward feature about the argument of prices falling for a long time after a big war was that they did not wait for the next war to start them up again. For some fifteen years up to our panic of 1857 prices showed a general rising tendency, while the last low point was in 1896 and in the next fourteen years prices nearly doubled. Then they were substantially stationary in 1910-15 inclusive.

Certainly there have been a great many other influences to affect the course of commodity prices. As we make progress in producing any article its price, other things being equal, ought to decline. The producer should be no worse off per unit, but better off on account of there being more units while the general public would be better off by getting more units. Furthermore, the validity of long range averages is open to question because it is necessary to add new commodities from time to time. Today's average merely of the commodities traded in a half century or century ago would mean very little in the present-day family or other budget.

Steel Scrap and High-Test Irons

IT is not so long since the use of scrap steel in the cupola was new. First known as "semi-steel," the merits of the product were acknowledged but there were objections to its name. Later by general agreement it was called "high-test iron."

At the comprehensive symposium on high-test irons conducted at the foundrymen's convention in Chicago, the fact stood out that scrap steel is a necessary raw material in most of the six methods of making such castings. Repeatedly in the discussion it was stated that steel scrap is essential to the production of a low-carbon cast iron. This is true also when nickel, chromium or molybdenum alloy castings are required. In some foundries the charges run as high as 95 per cent in steel scrap, virtually making a synthetic cast iron from steel.

Scrap steel, therefore, so far as high-test irons are concerned, has advanced from an ordinary and at one time a discredited raw material to a highly essential one. Rightly used, it makes an iron casting of unusual properties and is proving an important factor in bringing the gray-iron foundry to a higher plane.

CORRESPONDENCE

Steel vs. Cement at Airports

To the Editor: After reading your editorial of April 18 on "Hangars of Cement, or of Steel?" I am reminded that probably the greatest commercial waste in the United States today results from the expenditure of money for propaganda to promote undertakings which are obviously uneconomical and impractical from an engineering standpoint. It seems to me that the cement company referred to is engaging in such waste.

So rapidly has aviation progressed in this country that we are in danger of becoming unmindful of the basic principles upon which the constituent parts of aviation industries are to be supplied. We can profit from the experience to date of aviation companies in Europe, comparatively slight though it may be. In the building of hangars and other airport structures, we must keep in mind the rapidly changing art of aviation and the swift rate of obsolescence. Buildings must afford those accommodations required of them, but they should likewise be subject to easy change and rich salvage. A hangar or other structure which possesses no salvage value, and which might not be removed or remodeled without drilling and blasting, is hardly the most efficient which can be erected at an airport; and a building which is easily flammable would hardly offer the protection which the airplane and its accessories require.

If an airfield is to be used constantly, and if airlines are to maintain anything like a fixed schedule, provision must be made to operate in unfavorable weather. Slippery runways, or runways which are liable to become dangerous when coated with ice, have no place on a field. The United States army has come to this conclusion and is now using cinder paths for runways.

A few months ago the average wing spread of airplanes was considerably less than it is today. Some of the hangars constructed on fields already in existence provided door openings of less than 100 ft., and today many commercial planes have wing spreads of well over 100 ft. and we may expect to see them increased to 150 ft. before the summer is over. First class hangars should certainly have a clearance of at least 200 ft. if they are to continue useful for the present season and if rapid obsolescence is to be avoided.

Problems of economy have been solved with structural steel, and we are working on the problems of layout and design. Fireproofing regulations have yet to be perfected, but conferences to that end have been had with

the underwriters and other officials interested. It is agreed that structural steel hangars can be fireproofed in a manner to meet the requirements of the airplane. Assuredly the fire risk on a gasoline-driven airplane is great. So is the fire risk on a gasoline-driven motor car. We have found satisfactory and economical means of fireproofing structural steel in garages and we can as readily find acceptable methods of fireproofing structural steel in hangars.

The steel industry has here a duty to perform, for again it is called upon to offset some of the paid propaganda which is being spread throughout the country by means of advertisement, printed article and architectural contests. American airports should not be cluttered up with expensive and inefficient structures just because some dreamer or selfishly interested party thinks the design is aesthetic, or architecturally desirable. It speaks well for the engineers now engaged in the designing of our new airports that they have been generally unmindful of this propaganda and that structural steel is very generally specified for hangar construction.

F. H. FRANKLAND,
Manager of technical service American Institute of Steel Construction, Inc.
New York.

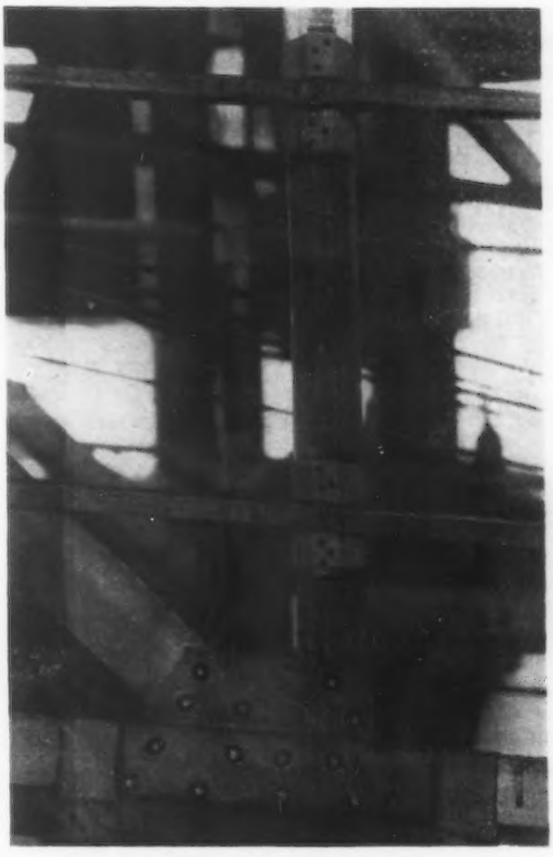
Jointing Duralumin in Aircraft

To the Editor: I have read your editorial "Duralumin in Aircraft" in the May 30 issue. What you say about the multiplicity of rivets in the current aeronautical structure and their consequent cost is all too apparent to those in the aircraft industry. May I point out some possibilities in addition to your suggestion of electric spot welding?

An interesting variation in the use of duralumin rivets is encountered in the "metal clad" airship now being completed by the Aircraft Development Corporation at Detroit. The skin of this airship is 0.008 in. duralumin, and required about 3,000,000 very small duralumin rivets for riveting the seams. One of the serious problems encountered was to devise methods for doing the riveting mechanically. The seams have a width of 0.5 in., and are joined with three rows of rivets, 12 per inch in each row. The special automatic riveting machine was developed which was described in your issue of Nov. 18, 1926, and makes the rivets from duralumin wire 0.039 in. in diameter. This wire is automatically fed into the machine, which makes the rivets, feeds the work and puts the rivets into place at the rate of over 5000 per hour. In a way it operates considerably like a sewing machine, and the strength of the seam produced exceeds the yield point of the sheet itself.

This rivet stitching machine is now being used to construct the hull of an amphibian flying boat, and it is further proposed to develop its application to the fabrication of monocoque airplane fuselages. With such rapid production possibilities as actually used on the metal clad airship, this may well be applied to a great deal of duralumin fabrication.

Another possibility, in rather the opposite direction as far as riveting is concerned, has been the development of extruded duralumin structural shapes, similar to the structural shapes now used in steel fabrication. By means of these relatively strong members (angles, channels and tees), it is possible to reduce the number of rivets required, in that larger rivets are used in the relatively heavier members. The point is shown in the attached photograph. By the simplicity of joint attainable (again similar to structural steel practice) and its extreme accessibility, riveting costs are greatly reduced. The fuselage made of extruded duralumin shapes looks very unlike the highly riveted conventional design of duralumin strip and stampings. The possibilities of these



Fuselage Skeleton Made of Extruded Duralumin Shapes by Gates Day Aircraft Corporation. Only angles and channels are used and a few large rivets are sufficient for each intersection. The wood stringers are for attaching the fabric covering

structural shapes in aeronautical mass production fabrication in duralumin are very great and their use is expanding rapidly.

JOHN F. HARDECKER,
Chief draftsman United States Naval Aircraft Factory.
Philadelphia.

While metal skeletons are standard practice for fuselages of American aircraft, most builders use wood extensively in the wings. *Engineering* (May 17) prints many sketches showing the all-metal wing construction employed by the aviation branch of Vickers, Ltd., London. Duralumin is used for all members except diagonal tie wires. The most important members, e.g., the fore and aft spars, are riveted girders.

Schedule of the next instalments of the ***Business Analysis and Forecast,*** *by Dr. Lewis H. Haney, Director, New York University Bureau of Business Research, follows:* ***June 20****—Position of Iron and Steel Producers;* ***July 4****—Activity in Steel Consuming Industries.*

May Iron Output Establishes a Record

Daily Rate 891 Tons Over Best Previous Month and 3658 Tons or 3 Per Cent Over April—Net Gain of Four Furnaces

A NEW record in pig iron production for all time was made in May. With complete data from every active furnace, the daily output was 125,745 gross tons, exceeding the best previous daily rate of 124,764 tons in May, 1923, by almost 1000 tons. The total output for the month has never been equalled. Production for the first five months also establishes a new high.

Total May pig iron output was 3,898,082 tons, or 125,745 tons per day, for the 31 days, as compared with 3,662,625 tons, or 122,087 tons per day, for the 30 days in April. This is a gain for May of 3658 tons in the daily rate, or 3 per cent. In May, 1923, the production was 3,867,694 tons, or 124,764 tons per day.

Respecting the new record for the first five months, there was produced to June 1, this year, 17,923,735 tons, exceeding by 758,646 tons the best previous first five months, in 1923, when the total was 17,165,089 tons. The record for any consecutive five months was 18,296,077 tons for the period March through July, 1923, the year 1923 being the high record in pig iron.

Operating Rate on June 1

There were 219 furnaces active on June 1, having an estimated daily operating rate of 126,150 tons. This contrasts with 122,980 tons per day for the 215 furnaces active on May 1. Six furnaces were blown in during May and two were shut down, a net gain of four.

The two furnaces blown out were

Daily Average Production of Coke Pig Iron in the United States by Months Since Jan. 1, 1925—Gross Tons

	1925	1926	1927	1928	1929
Jan.	108,720	106,974	100,123	92,573	111,044
Feb.	114,791	104,408	105,024	100,004	114,507
Mar.	114,975	111,032	112,366	103,215	119,822
Apr.	108,632	115,004	114,074	106,183	122,087
May	94,542	112,304	109,385	105,931	125,745
June	89,115	107,844	102,988	102,733	.....
½ year	105,039	109,660	107,351	101,763	.....
July	85,936	103,978	95,199	99,091	.....
Aug.	87,241	103,241	95,073	101,180	.....
Sept.	90,873	104,543	92,498	102,077	.....
Oct.	97,528	107,553	89,810	108,832	.....
Nov.	100,767	107,890	88,279	110,084	.....
Dec.	104,853	99,712	86,960	108,705	.....
Year	99,735	107,043	99,266	103,382	.....

Pig Iron Production by Districts, Gross Tons

	May (31 days)	April (30 days)	March (31 days)	February (28 days)
New York and Mass.	265,512	257,299	259,771	219,940
Lehigh Valley	108,803	93,506	96,978	85,686
Schuylkill Valley	74,312	69,684	71,002	55,843
Lower Susq. and Lebanon Valleys	33,392	31,150	34,490	31,403
Pittsburgh district	814,944	780,896	779,013	655,405
Shenango Valley	157,952	143,260	134,854	115,619
Western Pennsylvania	159,960	152,942	153,483	135,767
Maryland, Va. and Ky.	135,073	118,785	110,748	87,889
Wheeling district	147,933	142,470	146,546	129,082
Mahoning Valley	389,129	364,373	372,329	331,653
Central and North'n Ohio	388,958	318,678	326,677	303,770
Southern Ohio	47,635	44,139	47,600	40,351
Illinois and Indiana	795,902	768,307	790,784	666,236
Mich., Minn., Mo., Wis., Colo. and Utah	145,840	135,191	134,987	130,649
Alabama	235,117	235,787	249,079	211,061
Tennessee	6,620	6,158	6,132	5,831
Total	3,898,082	3,662,625	3,714,473	3,206,185

Daily Rate of Pig Iron Production by Months—Gross Tons

	Steel Works Iron	Merchant Iron*	Total
May, 1928	85,576	20,355	105,931
June	81,630	21,103	102,733
July	79,513	19,578	99,091
August	82,642	18,538	101,180
September	82,590	19,487	102,077
October	88,051	20,781	108,832
November	88,474	21,610	110,084
December	85,415	23,290	108,705
January, 1929	85,530	25,514	111,044
February	89,246	25,261	114,507
March	95,461	24,361	119,822
April	95,680	26,407	122,087
May	100,174	25,571	125,745

*Includes pig iron made for the market by steel companies.

Coke Furnaces in Blast

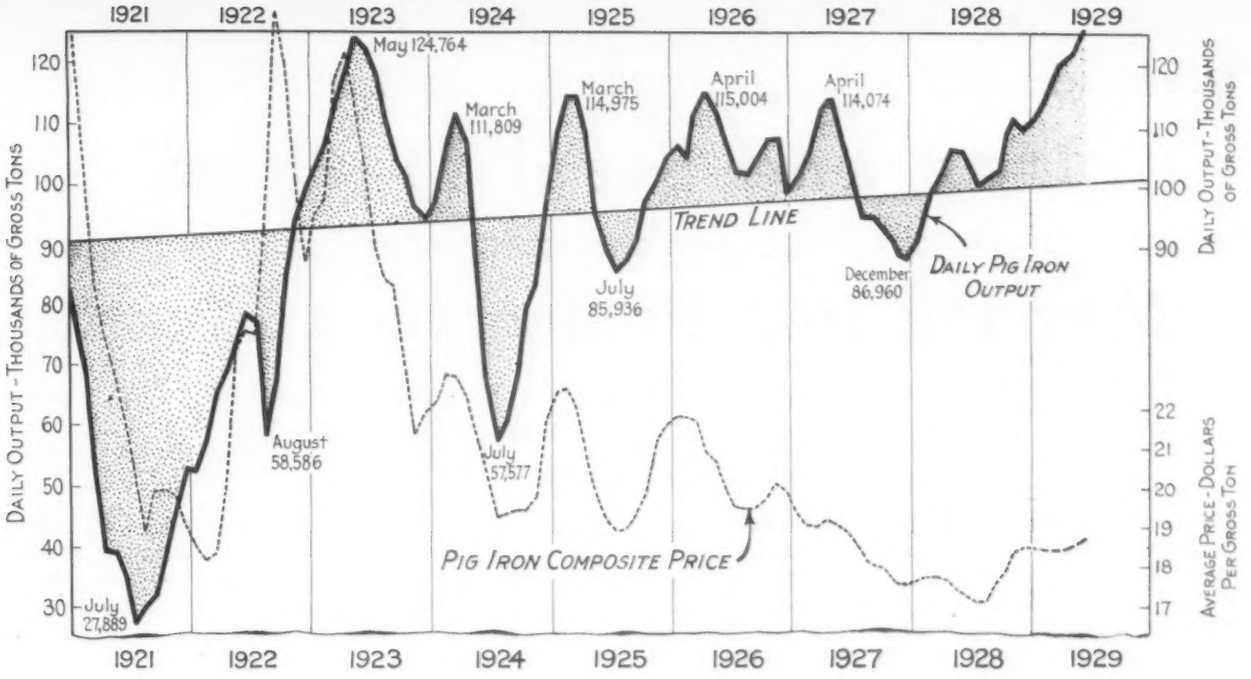
Furnaces	June 1 Number in Blast	June 1 Gross Tons per Day	May 1 Number in Blast	May 1 Gross Tons per Day
New York:				
Buffalo	14	7,455	14	7,490
Other N. Y. and Mass.	3	1,110	3	1,085
New Jersey	0	....	0	....
Pennsylvania:				
Lehigh Valley	8	3,510*	8	3,615*
Schuylkill Valley	5	2,400	5	2,320
Susquehanna Valley	2	1,075	2	1,040
Ferromanganese	0	....	0	....
Lebanon Valley	0	....	0	....
Ferromanganese	0	....	0	....
Pittsburgh District	40	25,860	40	26,500
Ferromanganese and Spiegeleisen	2	325	3	625*
Shenango Valley	9	5,095	9	4,940
Western Pennsylvania	9	4,750	9	4,700
Ferromanganese and Spiegeleisen	2	410	2	420
Maryland	6	3,580	6	3,495
Wheeling District	8	4,770	8	4,750
Ohio:				
Mahoning Valley	20	12,600	19	11,340
Central and Northern	20	12,545	19	11,390
Southern	3	1,530	3	1,470
Illinois and Indiana	36	25,675	36	25,610
Mich., Wis. and Minn.	7	3,470	6	2,965
Colo., Mo. and Utah	3	1,230	3	1,275
The South:				
Virginia	0	....	0	....
Ferromanganese and Spiegeleisen	1	95	1	110*
Kentucky	2	730	1	....
Alabama	17	7,585	17	7,635
Ferromanganese	0	....	0	....
Tennessee	2	350	1	205
Total	219	126,150	215	122,980

*Includes spiegeleisen.

Production of Coke Pig Iron in United States by Months Beginning Jan. 1, 1927—Gross Tons

	1927	1928	1929
Jan.	3,103,820	2,869,761	3,442,370
Feb.	2,940,679	2,900,126	3,206,185
Mar.	3,483,362	3,199,674	3,714,473
Apr.	3,422,226	3,185,504	3,662,625
May	3,390,940	3,283,856	3,898,082
5 mos.	16,301,027	15,438,921	17,923,735
June	3,089,651	3,082,000	.....
½ year	19,430,678	18,520,921	.....
July	2,951,160	3,071,824	.....
Aug.	2,947,276	3,136,570	.....
Sept.	2,774,949	3,062,314	.....
Oct.	2,784,112	3,373,806	.....
Nov.	2,648,376	3,302,523	.....
Dec.	2,695,755	3,369,846	.....
Year*	36,232,306	37,837,804	.....

*These totals do not include charcoal pig iron. The 1928 production of this iron was 142,960 gross tons.



Production of Pig Iron in May Represented an Average Output per Furnace of Over 575 Tons

Inclined line represents the gradually increasing theoretical needs of the country, ascertained by a balancing of the ups and downs in production. It shows an average yearly increase in consumption of about 423,000 tons

Steel Corporation stacks. That corporation, however, blew in three furnaces making a net gain of one for the month. Two independent steel company furnaces were blown in and also one merchant stack. The net gain for the month of four furnaces was three steel-making and one merchant stack.

Large Gain in Steel-Making Iron

Steel-making production in May was 100,174 tons per day, a gain of 4494 tons per day over the 95,680 tons as the daily rate in April. At 25,571 tons per day for merchant iron last month, there was a loss of 836 tons.

Manganese Alloys in May

Ferromanganese output in May at 25,896 tons was the third largest this year and compares with 22,413 tons in April. Production of spiegeleisen last month was small, only one company making this alloy.

Furnaces Blown In and Out

Among the furnaces blown in during May were the following: One Edgar Thomson furnace of the Carnegie Steel Co. in the Pittsburgh district, the Norton furnace in Kentucky, one Ohio furnace of the Carnegie Steel Co. in the Mahoning Valley, one Central furnace of the American Steel & Wire Co. in Northern Ohio, one furnace of the Minnesota Steel Co. in Minnesota and the Johnson City furnace in Tennessee.

Only two furnaces were blown out or banked during May: One Edgar Thomson furnace and one Lucy furnace of the Carnegie Steel Co. in the Pittsburgh district.

Production of Steel Companies for Own Use—Gross Tons

	Total Pig Iron Spiegel and Ferromanganese			Ferromanganese*		
	1927	1928	1929	1927	1928	1929
Jan.	2,343,881	2,155,133	2,651,416	31,844	22,298	28,208
Feb.	2,256,651	2,274,880	2,498,901	24,560	19,320	25,978
Mar.	2,675,417	2,588,158	2,959,295	27,834	27,912	24,978
Apr.	2,637,919	2,555,500	2,826,028	24,735	18,405	22,413
May	2,619,078	2,652,872	3,105,404	28,734	29,940	25,896
5 mos.	12,532,946	12,226,543	14,041,044	137,707	117,875	127,473
June	2,343,409	2,448,905	.....	29,232	32,088	.....
½ year	14,876,355	14,675,448	.....	166,939	149,963	.....
July	2,163,101	2,464,896	.....	26,394	32,909	.....
Aug.	2,213,815	2,561,904	.....	21,279	24,583	.....
Sept.	2,090,200	2,477,695	.....	20,675	22,278	.....
Oct.	2,076,722	2,729,589	.....	17,710	23,939	.....
Nov.	1,938,043	2,654,211	.....	17,851	29,773	.....
Dec.	1,987,652	2,647,863	.....	20,992	28,618	.....
Year	27,345,888	30,211,606	.....	291,840	312,061	.....

*Includes output of merchant furnaces.

Budd Output Gains

The Edward G. Budd Mfg. Co. of Philadelphia and Detroit reports a production of 860,000 automobile doors for the first four months of the current year. This compares with 1,300,000 doors for the entire year 1928 and 1,100,000 for 1927.

National Machine Tool Builders' Association has issued a list of the companies which have engaged exhibit space at the Machine Tool Exposition to be held in Cleveland Sept. 30 to Oct. 4, inclusive, this year. The exposition committee consists of J. W. Carrel, Lodge & Shipley Machine Tool Co., chairman; P. E. Bliss, Warner & Swasey Co.; Ralph E. Flanders, Jones & Lamson Machine Co.; Robert M. Gaylord, Ingersoll Milling Machine Co.; James E. Gleason, Gleason Works; Henry Buker, Brown & Sharpe Mfg. Co. Roberts Everett is exposition manager.

Glenn L. Martin Co., Baltimore, has been awarded a contract by the Navy Department for 25 type V-3 airplanes with spare parts and handling gears at a cost of $1,440,971.40. An option also provides for furnishing five additional planes with 25 per cent spare parts at a cost of $239,375. On June 21 the Navy Department will open bids on 18 PY-type monoplanes.

Iron and Steel Markets

May Pig Iron Production a Record

New High Marks Reached in Both Monthly Output and Daily Rate—Another Month of Heavy Steel Production in Prospect—Scrap Higher at Pittsburgh

PIG iron production in May established a new monthly record for both total output and rate per day. Blast furnace returns to THE IRON AGE show a total of 3,898,082 tons made during the month and a daily average of 125,745 tons, compared with 3,867,694 tons and a daily rate of 124,764 tons in May, 1923, when the highest previous figures were reached.

The largest output achieved by nearly 1000 tons per day, production last month was also 3658 tons, or 3 per cent, higher on a daily basis than in April. Output in the first five months, at 17,924,000 tons, was the greatest for that period in six years, exceeding the 1923 total by nearly 760,000 tons.

Four more furnaces were in blast June 1 than at the beginning of May, six having been put in and two having been blown out.

Steel ingot output in May, although virtually at the limit of capacity, probably fell short of the monthly record reached in March and the very high total of April. Wear and tear on equipment have become more of a factor as the period of peak activity has extended.

With June well begun Steel Corporation subsidiaries are still producing at above rated capacity and independents are not far behind. In view of unusually heavy shipments and a gradual recession in demand, the Steel Corporation is expected to report a reduction in unfilled orders. Backlogs are still so large, however, that no material change in operations is indicated for another month at least.

Even after specifications for finished steel commence to show appreciable shrinkage it will be necessary to run open-hearth furnaces at capacity for some time to build up reserve supplies of raw steel, now scraping bottom.

Demand from the automotive industry continues to decline, but, with the two largest makers of low-priced motor cars maintaining their production schedules, automobile output for June will probably show only a moderate recession from that of May. The current downward trend is expected to reach its low point in mid-July, when there will be a general slowing down to bring out new models.

Though mill deliveries are improving in automobile steels, backlogs are holding their own in heavier rolled products. In fact, at Pittsburgh mill commitments in plates have increased, now covering 10 to 12 weeks of operations.

A seasonal decline in tin plate specifications has been accentuated by unfavorable weather conditions, but mill operations still average 88 per cent for the leading interest while they range from 80 to 100 per cent of capacity for independents.

Reduced building activity has not yet been felt by the steel industry, partly because it has not extended to large projects, taking structural steel, and partly because of the extra demands from other consuming lines.

The changed outlook in agriculture, because of the decline in wheat, is also without effect, to date at least, on the high rate of steel consumption in farm equipment plants.

The amount of steel going into miscellaneous uses, particularly the growing needs in new industries, such as the manufacture of radios and electrical refrigerators, is proving a stabilizing influence, tending to iron out fluctuations in demand from the more prominent consuming lines.

Present mill prices have been reaffirmed on virtually all of the lighter rolled products and at Chicago on plates, shapes and bars also. Among semi-finished products wire rods are quoted for third quarter at $42, Pittsburgh or Cleveland, which is a continuation of the current price. No action has yet been taken on sheet bars, billets and slabs, but if the existing quotation of $36, Cleveland or Youngstown, is named, it will be equivalent to an advance, since virtually all consumers covered for the second quarter at lower prices.

Buyers manifest little interest in third quarter contracts, but this is not surprising, since much second quarter tonnage will be carried over, some of it until the end of July and beyond. The consuming trade, moreover, is reluctant to make new commitments until there is less uncertainty about business conditions in the latter part of the year.

The same hesitancy is to be observed in pig iron. Except at Chicago, where 70 per cent of third quarter contract tonnage is reported placed, there has been no real buying movement for the next three-month period. Melters are delaying action not only because of possible price advantage but also, in many cases, because they do not yet definitely know their forward needs.

In scrap, reluctance to contract for other than brief periods is also evident, but the market at Pittsburgh is stronger, heavy melting grade having advanced 50c. a ton.

Water shipments of Lake Superior ore in May, at 9,549,273 gross tons, broke all records for the month. The highest previous total was in May, 1918, when 8,792,231 tons was moved.

Both of THE IRON AGE composite prices are unchanged, pig iron at $18.71 a ton and finished steel at 2.412c. a lb.

A Comparison of Prices

Market Prices at Date, and One Week, One Month and One Year Previous. Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron, Per Gross Ton:	June 4, 1929	May 28, 1929	May 7, 1929	June 5, 1928
No. 2 foundry, Philadelphia	$21.76	$21.76	$21.76	$20.76
No. 2, Valley furnace	18.50	18.50	18.50	16.75
No. 2, Southern, Cin'ti	18.69	18.69	18.69	19.69
No. 2, Birmingham	15.00	15.00	15.00	16.00
No. 2 foundry, Chicago*	20.00	20.00	20.00	18.00
Basic, del'd eastern Pa.	20.25	20.25	20.25	19.00
Basic Valley furnace	18.50	18.50	18.00	15.35
Valley Bessemer, del'd P'gh.	20.76	20.76	20.76	18.76
Malleable, Chicago*	20.00	20.00	20.00	18.00
Malleable, Valley	19.00	19.00	19.00	17.00
Gray forge, Pittsburgh	19.76	19.76	19.26	18.01
L. S. charcoal, Chicago	27.04	27.04	27.04	27.04
Ferromanganese, furnace	105.00	105.00	105.00	105.00
Rails, Billets, Etc., Per Gross Ton:				
Rails, heavy, at mill	$43.00	$43.00	$43.00	$43.00
Light rails at mill	36.00	36.00	36.00	36.00
Rerolling billets, Pittsburgh	36.00	36.00	36.00	33.00
Sheets bars, Pittsburgh	36.00	36.00	36.00	34.00
Slabs, Pittsburgh	36.00	36.00	36.00	33.00
Forging billets, Pittsburgh	41.00	41.00	41.00	38.00
Wire rods, Pittsburgh	42.00	42.00	42.00	42.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	1.85	1.85	1.85	1.85
Finished Steel, *Per Lb. to Large Buyers:*	Cents	Cents	Cents	Cents
Bars, Pittsburgh	1.95	1.95	1.95	1.85
Bars, Chicago	2.05	2.05	2.05	2.00
Bars, Cleveland	1.95	1.95	1.95	2.04
Bars, New York	2.29	2.29	2.29	2.19
Tank plates, Pittsburgh	1.95	1.95	1.95	1.85
Tank plates, Chicago	2.05	2.05	2.05	2.00
Tank plates, New York	2.22½	2.22½	2.22½	2.17½
Structural shapes, Pittsburgh	1.95	1.95	1.95	1.85
Structural shapes, Chicago	2.05	2.05	2.05	2.00
Structural shapes, New York	2.19½	2.19½	2.19½	2.14½
Cold-finished bars, Pittsburgh	2.30	2.30	2.30	2.20
Hot-rolled strips, Pittsburgh	1.90	1.90	1.90	1.75
Cold-rolled strips, Pittsburgh	2.75	2.75	2.75	3.00

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

Finished Steel, *Per Lb. to Large Buyers:*	June 4, 1929 Cents	May 28, 1929 Cents	May 7, 1929 Cents	June 5, 1928 Cents
Sheets, black, No. 24, P'gh	2.85	2.85	2.85	2.65
Sheets, black, No. 24, Chicago dist. mill	3.05	3.05	3.05	2.80
Sheets, galv., No. 24, P'gh	3.60	3.60	3.60	3.50
Sheets, galv., No. 24, Chicago dist. mill	3.80	3.80	3.80	3.70
Sheets, blue, No. 13, P'gh	2.35	2.35	2.20	2.10
Sheets, blue, No. 13, Chicago dist. mill	2.45	2.45	2.40	2.20
Wire nails, Pittsburgh	2.65	2.65	2.65	2.55
Wire nails, Chicago dist. mill	2.70	2.70	2.70	2.70
Plain wire, Pittsburgh	2.50	2.50	2.50	2.50
Plain wire, Chicago dist. mill	2.55	2.55	2.55	2.55
Barbed wire, galv., Pittsburgh	3.30	3.30	3.30	3.35
Barbed wire, galv., Chicago dist. mill	3.35	3.35	3.35	3.40
Tin plate, 100 lb. box, P'gh	$5.35	$5.35	$5.35	$5.25
Old Material, Per Gross Ton:				
Heavy melting steel, P'gh	**$18.25**	$17.75	$18.25	$14.75
Heavy melting steel, Phila	16.00	16.00	16.50	13.50
Heavy melting steel, Ch'go	*15.00*	15.25	15.50	12.75
Carwheels, Chicago	14.50	14.50	14.50	13.25
Carwheels, Philadelphia	16.00	16.00	16.50	15.50
No. 1 cast, Pittsburgh	15.00	15.00	15.00	14.25
No. 1 cast, Philadelphia	16.50	16.50	16.50	16.00
No. 1 cast, Ch'go (net ton)	15.00	15.00	15.50	14.00
No. 1 RR. wrot., Phila	16.00	16.00	16.00	15.00
No. 1 RR. wrot., Ch'go (net)	14.00	14.00	14.00	11.50
Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt	$2.75	$2.75	$2.75	$2.60
Foundry coke, prompt	3.75	3.75	3.75	3.75
Metals, *Per Lb. to Large Buyers:*	Cents	Cents	Cents	Cents
Lake copper, New York	18.12½	18.12½	18.12½	14.87½
Electrolytic copper, refinery	17.75	17.75	17.75	14.50
Tin (Straits), New York	*43.62½*	43.87½	44.00	49.25
Zinc, East St. Louis	*6.55*	6.60	6.60	6.12½
Zinc, New York	*6.90*	7.00	6.95	6.47½
Lead, St. Louis	**6.80**	6.75	6.80	6.17½
Lead, New York	7.00	7.00	7.00	6.30
Antimony (Asiatic), N. Y.	8.87½	9.00	9.25	10.50

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

Pittsburgh

High Rate of Steel Production Assured Through June and Possibly Well Into July—Scrap Stronger

PITTSBURGH, June 4.—Indications of a decline in the rate of steel production are not easily found in the immediate Pittsburgh district. Reports from nearby steel producing centers also continue to be generally favorable, although there have been occasions when lack of crude steel has temporarily checked rolling mill schedules. However, the scarcity of semi-finished steel has abated considerably, even though most finishing mills are operating with less than a week's supply of raw material. This will make it necessary for open-hearth furnaces to be run at capacity for some time after finishing mill schedules have been adjusted downward, as a considerable reserve supply of raw steel is normally maintained by the mills.

Plate business is keeping up better than other lines, specifications still being ahead of both shipments and operations. Heavy demand for plates did not develop until after the peak of buying for other steel products had been reached, but judging by the large June and July requirements of the leading consuming industries it will continue well into the third quarter.

Sheet production is also likely to keep up during the summer months, as present backlogs have been reduced very little and curtailment in the production of automobile body builders will not be seriously felt for several weeks. Other consuming lines are also taking sheets in undiminished quantities, and operations throughout June and a large part of July will show little interruption.

Tin plate production is gradually declining, as the seasonal peak has been passed and unfavorable weather conditions in all parts of the country have led to hesitancy on the part of the largest consumers.

Lack of buyers' interest in third quarter requirements is looked upon as a bearish factor in the present situation, but it is pointed out that deliveries against second quarter contracts on some products will not be made until late July and that consumers could scarcely be expected to commit themselves over a longer period in view of the uncertainty of business conditions in the last half of the year. This situation is also reflected in the pig iron market, where third quarter buying is developing slowly; and in scrap, where mills are reluctant to cover their needs for other than brief periods.

Third quarter prices on the principal light steel products have now been announced, and present maximum quotations are continued on all except blue annealed sheets, on which a change in base has been introduced. On bars, shapes and plates there is little likelihood of a change.

Non-integrated mills still object to higher third quarter prices on semi-finished steel, but leading producers do not expect the contract price to be less than $36 a ton on billets, slabs and sheet bars. However, it is freely suggested that, as the third quarter is not considered a good time for an

advance in rolled steel prices, higher quotations on raw steel would not be opportune. Any weakening in the price of semi-finished steel ordinarily develops pressure for lower finished steel prices, which mills might be unable to resist in the face of a lighter demand.

Semi-Finished Steel.—Rolling mills in this district have about a week's supply of steel as an average for all products requiring the open-hearth product, but non-integrated sheet mills are often forced to operate on a narrower margin. On some grades of sheets, notably roofing and corrugated, Bessemer steel is being substituted occasionally for open-hearth material, but this has been done frequently in the past to facilitate rolling schedules after the customer's consent has been obtained. A more serious shortage of crude steel is reported from nearby districts than from the immediate Pittsburgh area, although no opportunity has yet been offered to build up reserves which have been depleted during the last two months. The difficulty of securing an adequate supply of unfinished steel has also cut down the supply of wire rods, and, although no definite shortage has been noticed, rod makers are operating on a closer margin than usual. No announcement of third quarter prices on billets, slabs and sheet bars has been made. It is generally assumed that only a very marked falling off in the demand for steel products in the next two weeks would lead producers to quote less than $36, Pittsburgh or Youngstown.

Pig Iron.—Third quarter buying has not yet developed to any extent in this or the Valley district and the total sales during the last week for immediate delivery were probably larger with most sellers than forward business. Most of the large consumers in the district still have enough iron on present contracts to last until the end of the month, and nearly all are awaiting market developments before making further commitments. The fact that sales of Valley iron at the present quotations, with the possible exception of basic, have not amounted to any considerable tonnage, and the adding of $1 to the selling price since the last heavy buying movement are incentives to hesitation. Also, the blowing in of a merchant furnace in the Pittsburgh district has not strengthened the Valley market. With delivered prices in the Pittsburgh area definitely lower, Valley makers are faced with the necessity of lowering their quotations to sell in this consuming district, and thus the territory in which they may maintain present quotations without price competition is definitely narrowed. Five merchant furnaces are now operating in the Valleys, and, as the Neville Island furnace at Pittsburgh went in on June 3, the combined supply of iron in the two consuming areas will be larger than it has been for several years, without including the output of certain steel company stacks which are definitely committed to the merchant market. Iron foundries in the district are by no means at capacity, although the requirements of steel foundries are heavier than usual. Summer activity promises to hold up fairly well, and the well sustained rate of steel operations is encouraging to the pig iron industry.

Prices per gross ton, f.o.b. Valley furnace:

Basic	$18.50
Bessemer	19.00
Gray forge	18.00
No. 2 foundry	18.50
No. 3 foundry	18.00
Malleable	19.00
Low phos., copper free	27.00

Freight rate to Pittsburgh or Cleveland district, $1.76.

Prices per gross ton f.o.b. Pittsburgh district furnace:

Basic	$19.00
No. 2 foundry	19.00
No. 3 foundry	18.50
Malleable	19.50

Freight rates to points in Pittsburgh district range from 63c. to $1.13.

Bars, Plates and Shapes.—Continued heavy demand for plates has further extended deliveries during the last week, and some mills now have backlogs sufficient for 10 or 12 weeks' operations. This demand is widely extended into varied consuming channels, particularly railroad car and barge builders, and the shortage of steel in the Chicago district has led to purchases of plates in the Pittsburgh district as well as in eastern Pennsylvania by the Milwaukee fabricator of steel pipe. Two inquiries for barges are expected to come out in the near future, both calling for at least six units, and the State of New York is taking bids this week on five steel scows for use on the Erie Canal. Large structural awards are not numerous, but the volume of small orders is fairly sizable. Demand for reinforcing bars is also holding up well and deliveries are extended to six weeks and sometimes eight. Prices for third quarter probably will remain at the present level of 1.95c. On shapes and bars, this figure is occasionally shaded.

Wire Products.—Makers of manufacturers' wire generally report heavier shipments during May than in April, this year, or May, last year, although the movement of wire and nails to the jobbing trade fell off somewhat, largely because of unseasonable weather. Conditions during the early days of this month show little change, although demand for fencing, barbed wire and other products going to the agricultural industry is holding up longer than usual. Wire makers have opened their books for third quarter at unchanged prices, or 2.50c. to 2.60c. per lb., Pittsburgh or Cleveland, for plain wire and $2.65 to $2.75 per keg for nails. These prices have generally been well established during the present quarter except in the South and Southwest.

Tubular Goods.—A few makers of drilling pipe for the oil country report slightly better business in that class of product during the last week or two, but definite indications of improvement are not easily distinguishable. There is little line pipe business in prospect just now, although mills are comparatively well occupied on present orders. Standard buttweld pipe is moving steadily, but the seasonal improvement in demand seems to be somewhat later than usual. Shipments of mechanical tubing and boiler tubes are still heavy, although a slight falling off in the requirements of the automobile industry is reported. This tendency, however, is reflected in specifications rather than shipments, the latter being fully up to recent levels.

Bolts, Nuts and Rivets.—Makers of bolts have generally adopted the resolution recently passed by the industry's association, requiring that the measurement of the length of all

The Iron Age Composite Prices

Finished Steel

June 4, 1929, 2.412c. a Lb.

One week ago	2.412c.
One month ago	2.412c.
One year ago	2.341c.
10-year pre-war average	1.689c.

Based on steel bars, beams, tank plates, wire, rails, black pipe and black sheets. These products make 87 per cent of the United States output of finished steel.

	High			Low	
1929	2.412c.,	April 2;	2.391c.,	Jan. 8	
1928	2.391c.,	Dec. 11;	2.314c.,	Jan. 3	
1927	2.453c.,	Jan. 4;	2.293c.,	Oct. 25	
1926	2.453c.,	Jan. 5;	2.403c.,	May 18	
1925	2.560c.,	Jan. 6;	2.396c.,	Aug. 18	

Pig Iron

June 4, 1929, $18.71 a Gross Ton

One week ago	$18.71
One month ago	18.67
One year ago	17.23
10-year pre-war average	15.72

Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

	High			Low	
1929	$18.71,	May 14;	$18.29,	March 19	
1928	18.59,	Nov. 27;	17.04	July 24	
1927	19.71,	Jan. 4;	17.54,	Nov. 1	
1926	21.54,	Jan. 5;	19.46,	July 13	
1925	22.50,	Jan. 13;	18.96,	July 7	

Mill Prices of Finished Iron and Steel Products

Iron and Steel Bars

Soft Steel

	Base per Lb.
F.o.b. Pittsburgh mill	1.95c.
F.o.b. Chicago	2.05c. to 2.15c.
Del'd Philadelphia	2.27c.
Del'd New York	2.29c.
Del'd Cleveland	1.95c. to 2.00c.
F.o.b. Cleveland	1.95c. to 2.00c.
F.o.b. Lackawanna	2.05c.
F.o.b. Birmingham	2.15c.
C.i.f. Pacific ports	2.35c.
F.o.b. San Francisco mills	2.35c. to 2.40c.

Billet Steel Reinforcing

F.o.b. Pittsburgh mills, 40, 50, 60-ft.	2.05c.
F.o.b. Pittsburgh mills, cut lengths	2.30c.
F.o.b. Birmingham, mill lengths	2.15c.

Rail Steel

F.o.b. mills, east of Chicago dist.	1.85c. to 1.90c.
F.o.b. Chicago Heights mill	1.95c.
Del'd Philadelphia	2.27c.

Iron

Common iron, f.o.b. Chicago	2.05c. to 2.10c.
Refined iron, f.o.b. P'gh mills	2.75c.
Common iron, del'd Philadelphia	2.12c.
Common iron, del'd New York	2.14c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill	1.95c.
F.o.b. Chicago	2.05c.
F.o.b. Birmingham	2.15c.
Del'd Cleveland	2.14c.
Del'd Philadelphia	2.15c.
F.o.b. Coatesville	2.05c.
F.o.b. Sparrow Point	2.05c.
F.o.b. Lackawanna	2.05c.
Del'd New York	2.22½c.
C.i.f. Pacific ports	2.20c. to 2.30c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill	1.95c.
F.o.b. Chicago	2.05c. to 2.15c.
F.o.b. Birmingham	2.15c.
F.o.b. Lackawanna	2.05c.
F.o.b. Bethlehem	2.05c.
Del'd Cleveland	2.14c.
Del'd Philadelphia	2.01c. to 2.06c.
Del'd New York	2.14½c.
C.i.f. Pacific ports	2.35c.

Hot-Rolled Hoops, Bands and Strips

	Base per Lb.
6 in. and narrower, P'gh	2.00c.
Wider than 6 in., P'gh	1.90c.
6 in. and narrower, Chicago	2.20c.
Wider than 6 in., Chicago	2.10c.
Cooperage stock, P'gh	2.20c.
Cooperage stock, Chicago	2.30c.

Cold-Finished Steel

	Base per Lb.
Bars, f.o.b. Pittsburgh mill	2.30c.
Bars, f.o.b. Chicago	2.30c.
Bars, Cleveland	2.35c.
Shafting, ground, f.o.b. mill	*2.65c. to 3.60c.
Strips, P'gh	2.75c. to 2.85c.
Strips, Cleveland	2.75c. to 2.85c.
Strips, del'd Chicago	3.05c. to 3.15c.
Strips, Worcester	2.90c. to 3.00c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland	4.25c. to 4.35c.

*According to size.

Wire Products

(Carload lots, f.o.b. Pittsburgh and Cleveland, to jobbers and retailers.)

	Base per Keg
Wire nails	$2.65 to $2.75
Galvanized nails	4.65 to 4.75
Galvanized staples	3.35 to 3.45
Polished staples	3.10 to 3.20
Cement coated nails	2.65 to 2.75
	Base per 100 Lb.
Bright plain wire, No. 6 to No. 9 gage	$2.50 to $2.60
Annealed fence wire	2.65 to 2.75
Spring wire	3.50 to 3.60
Galv'd wire, No. 9	3.10 to 3.20
Barbed wire, galv'd	3.30 to 3.40
Barbed wire, painted	3.05 to 3.15
Woven wire fence (per net ton to retailers)	65.00

Chicago district mill and delivered Chicago prices are $1 per ton above the foregoing. Birmingham mill prices $3 a ton higher; Worcester, Mass., (wire) mill $3 a ton higher on production of that plant; Duluth, Minn., mill $2 a ton higher; Anderson, Ind., $1 higher.

Cut Nails

	Per 100 Lb.
Carloads, Wheeling, Reading or Northumberland, Pa.	$2.70
Less carloads, Wheeling or Reading	2.80

Light Plates

No. 10, blue annealed, f.o.b. P'gh	2.20c.
No. 10, blue annealed, f.o.b. Chicago dist.	2.30c.

Sheets

Blue Annealed

	Base per Lb.
No. 13, f.o.b. P'gh	2.35c.
No. 13, f.o.b. Chicago dist.	2.45c.
No. 13, del'd Philadelphia	2.67c.

Box Annealed, One Pass Cold Rolled

No. 24, f.o.b. Pittsburgh	2.85c. to 2.95c.
No. 24, f.o.b. Chicago dist. mill	3.05c.
No. 24, del'd Philadelphia	3.17c. to 3.27c.
No. 24, f.o.b. Birmingham	3.00c. to 3.10c.

Metal Furniture Sheets

No. 24, f.o.b. P'gh	4.10c. to 4.20c.

Galvanized

No. 24, f.o.b. Pittsburgh	3.60c. to 3.70c.
No. 24, f.o.b. Chicago dist. mill	3.80c.
No. 24, del'd Cleveland	3.79c. to 3.89c.
No. 24, del'd Philadelphia	3.92c. to 4.02c.
No. 24, f.o.b. Birmingham	3.75c. to 3.85c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	3.00c.
No. 28, f.o.b. Chicago dist. mill	3.10c.

Automobile Body Sheets

No. 28, f.o.b. Pittsburgh	4.10c.

Long Ternes

No 24, 8-lb. coating, f.o.b. mill	4.00c.

Vitreous Enameling Stock

No. 24, f.o.b. Pittsburgh	3.90c.

Tin Plate

	Per Base Box
Standard cokes, f.o.b. P'gh district mills	$5.35
Standard cokes, f.o.b. Gary	5.45

Terne Plate

(*F.o.b. Morgantown or Pittsburgh*)

(Per Package, 20 x 28 in.)

8-lb. coating I.C.	$11.20
15-lb. coating I.C.	14.00
20-lb. coating I.C.	15.30
25-lb. coating I.C.	$16.70
30-lb. coating I.C.	17.75
40-lb. coating I.C.	19.85

Alloy Steel Bars

(F.o.b. makers' mill)

Alloy Quality Bar Base, 2.65c. to 2.75c. per Lb.

S.A.E. Series Numbers		Alloy Differential
2000	(½% Nickel)	0.25
2100	(1½% Nickel)	0.55
2300	(3½% Nickel)	1.50
2500	(5% Nickel)	2.25
3100	Nickel Chromium	0.55
3200	Nickel Chromium	1.35
3300	Nickel Chromium	3.80
3400	Nickel Chromium	3.20
4100	Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100	Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600	Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.25 to 1.75 Nickel)	1.05
5100	Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100	Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100	Chromium Spring Steel	0.20
6100	Chromium Vanadium Bars	1.20
6100	Chromium Vanadium Spring Steel	0.95
9250	Silicon Manganese Spring Steel (flats)	0.25
	Rounds and squares	0.50
	Chromium Nickel Vanadium	1.50
	Carbon Vanadium	0.95

Above prices are for hot rolled steel bars, forging quality. The ordinary differential for cold-drawn bars is ¾c. per lb. higher. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a sectional area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. carry the bar price.

Rails

	Per Gross Ton
Standard, f.o.b. mill	$43.00
Light (from billets), f.o.b. mill	36.00
Light (from rail steel), f.o.b. mill	34.00
Light (from billets), f.o.b. Ch'go mill	36.00

Track Equipment

	Base per 100 Lb.
Spikes, ⅜ in. and larger	$2.80
Spikes, ½ in. and smaller	2.80
Spikes, boat and barge	3.00
Tie plates, steel	2.15
Angle bars	$2.75
Track bolts, to steam railroads	$3.80 to 4.00
Track bolts, to jobbers, all sizes, per 100 count	70 per cent off list

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
⅛	45	19½	¼ and ⅜	+11	+36
¼ to ⅜	51	25½	½	23	5
½	56	42½	¾	28	11
¾	60	48½	1 and 1¼	31	15
1 to 3	62	50½	1½ and 2	35	18

Lap Weld

2	55	43½	2	23	9
2½ to 6	59	47½	2½ to 3½	28	13
7 and 8	56	43½	4 to 6	30	17
9 and 10	54	42½	7 and 8	29	16
11 and 12	53	40½	9 to 12	26	11

Butt Weld, extra strong, plain ends

⅛	41	24½	¼ and ⅜	+13	+48
¼ to ⅜	47	30½	½	23	7
½	53	42½	¾	28	12
¾	58	47½	1 to 2	34	18
1 to 1½	60	49½			
2 to 3	61	50½			

Lap Weld, extra strong, plain ends

2	53	42½	½	29	13
2½ to 4	57	46½	2½ to 4	34	20
4½ to 6	56	45½	4½ to 6	33	19
7 to 8	52	39½	7 and 8	31	17
9 and 10	45	32½	9 to 12	21	8
11 and 12	44	31½			

On carloads the above discounts on steel pipe are increased on block by one point, with supplementary discount of 5%, and on galvanized by 1½ points, with supplementary discount of 5%. On iron pipe, both black and galvanized the above discounts are increased to jobbers by one point with supplementary discounts of 5 and 2½%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		Charcoal Iron	
2 in. and 2¼ in.	40	1½ in.	1
2½ in.—2¾ in.	48	1¾ in.	8
3 in.	54	2 in.—2¼ in.	13
3¼ in.—3¾ in.	56	2½ in.—2¾ in.	16
4 in.	59	3 in.	17
4½ in. to 6 in.	48	3¼ in. to 3½ in.	18
		4 in.	20
		4½ in.	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold Drawn

1 in.	63	3 in.	48
1¼ to 1½ in.	55	3¼ to 3½ in.	50
1¾ in.	39	4 in.	53
2 to 2¼ in.	34	4½, 5 and 6 in.	42
2½ to 2¾ in.	42		

Hot Rolled

2 and 2¼ in.	40	3¼ to 3½ in.	56
2½ and 2¾ in.	48	4 in.	59
3 in.	54	4½, 5 and 6 in.	48

Bebond the above base discounts a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb. base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points, with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gage take mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30%, base (carloads)	55
Carbon, 0.30% to 0.40%, base	50

Plus differentials for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

bolts be made from the largest diameter of the bearing surface under the head to the extreme end of the point. In the case of countersunk head, deck and elevator bolts the overall dimension will prevail. Mill operations are being continued at 75 to 80 per cent of capacity, with the bulk of shipments going to the railroad car builders. Prices are unchanged.

Sheets. — Sheet mill operations were curtailed during the last week because of the hot weather and the mid-week holiday, but the leading interest will operate its mills this week at 98 per cent of capacity with the independents at only a slightly lower figure. The demand for blue annealed sheets and light plates is keeping up unusually well, and mill backlogs are being extended rather than reduced. Delivery promises on the blue annealed product now average about seven weeks. A considerably longer period is required for shipments of automobile body sheets. Declining specifications from the automobile body plants are being offset by heavier requirements of the railroad car builders, makers of farm products and manufacturers of electrical refrigerators and radio cabinets, to mention only a few of the sheet consuming channels which are taking increasirgly large tonnages. Consumers have shown little interest in their third quarter contract tonnages, but with deliveries on present contracts extended well into July, it is too early to expect future commitments. Mills have had little difficulty in securing the maximum quoted prices on such contracts as have been made.

Tin Plate.—Weather conditions are still influencing tin plate specifications. A decline is usually expected at this time in the year. Reports on crop conditions are rather indefinite and not generally favorable, so container manufacturers are marking time. Manufacturers of tin plate have turned out a rather large tonnage in anticipation of June requirements, but shipments are not yet moving freely. Operations of the leading interest will average about 88 per cent of capacity this week, a slightly better rate than that of the previous week, when several turns were missed on account of the hot weather and the holiday. Operations of the independents are mixed, ranging from practical capacity in one case to as low as 80 per cent in another.

Cold-Finished Steel Bars. — Mills have opened their books for third quarter, reaffirming the present price of 2.30c., Pittsburgh, and permitting customers to specify against contracts up to Sept. 30. In recent quarters the fifteenth of the final month has been the time limit for specifications against contracts, although consumers have often been able to obtain extensions. Tonnage releases against contracts are holding up well, in spite of a decline in the requirement of the automobile industry, but June will likely show a rather heavy decrease in total shipments, as compared with the previous three months.

Warehouse Prices, f.o.b. Pittsburgh

	Base per Lb.
Plates	3.00c.
Structural shapes	3.00c.
Soft steel bars and small shapes	2.90c.
Reinforcing steel bars	2.75c.
Cold-finished and screw stock—	
Rounds and hexagons	3.60c.
Squares and flats	4.10c.
Bands	3.25c.
Hoops	4.25c.
Black sheets (No. 24), 25 or more bundles	3.80c.
Galv. sheets (No. 24), 25 or more bundles	4.55c.
Blue ann'l'd sheets (No. 10), 1 to 10 sheets	3.45c.
Galv. corrug. sheets (No. 28), per square	$4.43
Spikes, large	3.40c.
Small	3.80c. to 5.25c.
Boat	3.80c.
Track bolts, all sizes, per 100 count,	60 per cent off list
Machine bolts, 100 count,	60 per cent off list
Carriage bolts, 100 count,	60 per cent off list
Nuts, all styles, 100 count,	60 per cent off list
Large rivets, base per 100 lb.	$3.50
Wire, black soft ann'l'd, base per 100 lb	$3.00 to 3.10
Wire, galv. soft, base per 100 lb.	3.00 to 3.10
Common wire nails, per keg	3.00
Cement coated nails, per keg	3.05

Hot-Rolled Strip.—May shipments of a few companies were equal to, if not greater than, those in April, but a moderate decline in business was more common. Specifications against contracts during the last week fell off slightly, largely because of a reduction in the requirements of several large automobile companies. However, the two largest makers of cars in the low-priced field are maintaining recent high production schedules, and the aggregate decline in business from that industry is not expected to be marked until mid-July, when there is a general slowing down for the introduction of new models. Third quarter order books have been opened, with prices unchanged at 2c., Pittsburgh, for 6-in. and narrower, and 1.90c. for the wider sizes.

Cold-Rolled Strip.—A general tapering in business is reported in the cold-rolled strip industry, although this has brought only a small reduction in mill backlogs. Delivery promises average about four weeks, the date depending, in many instances, on the ability of the hot mills to supply material for cold rolling. Third quarter business will be taken at the present quotations of 2.75c. to 2.85c., Pittsburgh or Cleveland. The higher price is being applied usually for difficult specifications and rush orders.

Coal and Coke.—Furnace coke is probably somewhat stronger, because supply is so closely adjusted to demand, but there have been no sales which would warrant quoting higher than $2.75 to $2.85, Connellsville. The foundry grade, however, is weaker, particularly at the higher side of the range, and although the special grades are firm at $4.85, ordinary foundry coke would probably not bring more than $4.25 for prompt shipments, as compared with $4.50 a month ago, while $3.75 is still done on the poorer grades. The coal market is still largely a buyers' affair, although the bottom is generally thought to have been reached.

Old Material. — The market has gained strength in the past week. Sizable sales of heavy melting steel have been made at $18.50 at two points in the district, and mills at these points still are in the market. Compressed sheets also have advanced 50c. a ton since a week ago, having been sold at $18.50. Interest in the market is slight except for these transactions. Dealers are not eager for business, finding that good heavy melting steel is hard to buy at a price which will yield a profit on present mill buying prices. Bundled sheets, sides and ends have been sold up to $16.75. The market also is firmer on machine shop turnings.

Prices per gross ton delivered consumers' yards in Pittsburgh and points taking the Pittsburgh district freight rate:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$18.00 to $18.50
No. 2 heavy melting steel	15.50 to 16.00
Heavy melting car sides	17.00 to 17.50
Scrap rails	17.25 to 17.75
Compressed sheet steel	18.00 to 18.50
Bundled sheets, sides and ends	16.25 to 16.75
Cast iron carwheels	16.00 to 16.50
Sheet bar crops, ordinary	18.50 to 19.00
Heavy breakable cast	13.00 to 13.75
No. 2 railroad wrought	18.00 to 18.50
Hvy. steel axle turnings	15.75 to 16.75
Machine shop turnings	11.00 to 11.50
Acid Open-Hearth Grades:	
Railr. knuckles and couplers	20.50 to 21.00
Railr. coil and leaf springs	20.50 to 21.00
Rolled steel wheels	20.50 to 21.00
Low phos. billet and bloom ends	22.00 to 22.50
Low phos., mill plates	22.00 to 22.50
Low phos., light grades	20.00 to 20.50
Low phos., sheet bar crops	20.00 to 21.00
Heavy steel axle turnings	15.75 to 16.75
Electric Furnace Grades:	
Low phos., punchings	19.50 to 20.50
Hvy. steel axle turnings	15.75 to 16.75
Blast Furnace Grades:	
Short shoveling steel turnings	12.00 to 12.50
Short mixed borings and turnings	12.00 to 12.50
Cast iron borings	12.00 to 12.50
Rolling Mill Grades:	
Steel car axles	21.50 to 22.00
Cupola Grades:	
No. 1 cast	15.00 to 16.00
Rails 3 ft. and under	19.50 to 20.50

Sundstrand Tool Company and Foundry Merged

The Rockford Union Foundry Co. has been merged with the Sundstrand Machine Tool Co., Rockford, Ill. Both plants will continue to operate separately under their former executives.

Charles Rystrom, former president of the Sundstrand company, becomes chairman of the board of directors; Hugo L. Olson is president and general manager; Levin Faust and G. D. Sundstrand, vice-presidents; George A. Lindblade, secretary-treasurer; and G. H. Ekstrom, assistant secretary-treasurer.

The combined company will retain the Sundstrand name.

Semi-Finished Steel, Raw Materials, Bolts and Rivets

Mill Prices of Semi-Finished Steel

Billets and Blooms

	Per Gross Ton
Rerolling, 4 in. and under 10 in., Pittsburgh	$36.00
Rerolling, 4 in. and under 10 in., Youngstown	36.00
Rerolling, 4 in. and under 10 in., Cleveland	36.00
Rerolling, 4 in. and under 10 in., Chicago	37.00
Forging quality, Pittsburgh	41.00

Sheet Bars

(Open Hearth or Bessemer)

	Per Gross Ton
Pittsburgh	$36.00
Youngstown	36.00
Cleveland	36.00

Slabs

(8 in. x 2 in. and under 10 in. x 10 in.)

	Per Gross Ton
Pittsburgh	$36.00
Youngstown	36.00
Cleveland	36.00

Skelp

(F.o.b. Pittsburgh or Youngstown)

	Per Lb.
Grooved	1.85c. to 1.90c.
Universal	1.85c. to 1.90c.
Sheared	1.85c. to 1.90c.

Wire Rods

(Common soft, base)

	Per Gross Ton
Pittsburgh	$42.00
Cleveland	42.00
Chicago	43.00

Prices of Raw Material

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range Bessemer, 51.50% iron	$4.80
Old range non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron ore, low phos., copper free, 55 to 58% iron in dry Spanish or Algerian	10.00c.
Iron ore, low phos., Swedish, average 68% iron	10.00c.
Iron ore, basic Swedish, average 65% iron	9.00c.
Manganese ore, washed, 52% manganese, from the Caucasus	33.00c. to 35.00c.
Manganese ore, Brazilian, African or Indian, basic 50%	33.00c. to 35.00c.
Tungsten ore, high grade, per unit, in 60% concentrates	$16.25 to $16.50

	Per Gross Ton
Chrome ore, 45 to 50% Cr_2O_3, crude, c.i.f. Atlantic seaboard	$22.00 to $24.00

	Per Lb.
Molybdenum ore, 85% concentrates of MoS_2, delivered	50c. to 55c.

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville prompt	$2.75 to $2.85
Foundry, f.o.b. Connellsville prompt	3.75 to 4.85
Foundry, by-product, Ch'go ovens	8.00
Foundry, by-product, New England, del'd	11.00
Foundry, by-product, Newark or Jersey City, delivered	9.00 to 9.40
Foundry, by-product, Phila.	9.00
Foundry, Birmingham	5.00
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry by-prod., del'd St. Louis	9.00

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.25 to $1.75
Mine run coking coal, f.o.b. W. Pa. mines	1.50 to 1.75
Gas coal, ¾-in., f.o.b. Pa. mines	1.90 to 2.00
Mine run gas coal, f.o.b. Pa. mines	1.65 to 1.75
Steam slack, f.o.b. W. Pa. mines	80c. to 90c.
Gas slack, f.o.b. W. Pa. mines	1.00 to 1.10

Ferromanganese

	Per Gross Ton
Domestic, 80%, seaboard	$105.00
Foreign, 80%, Atlantic or Gulf port, duty paid	105.00

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	$31.00 to $34.00
Domestic, 16 to 19%	29.00 to 32.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50%	$83.50
75%	130.00

	Per Gross Ton Furnace		Per Gross Ton Furnace
10%	$35.00	12%	$39.00
11%	37.00	14 to 16%	45.00

Bessemer Ferrosilicon

F.o.b. Jackson County, Ohio, Furnace

	Per Gross Ton		Per Gross Ton
10%	$31.00	12%	$35.00
11%	33.00		

Silvery Iron

F.o.b. Jackson County, Ohio, Furnace

	Per Gross Ton		Per Gross Ton
6%	$24.00	10%	$29.00
7%	25.00	11%	31.00
8%	26.00	12%	33.00
9%	27.00		

Other Ferroalloys

Ferrotungsten, per lb., contained metal del'd	$1.40 to $1.50
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	11.00c.
Ferrovanadium, per lb. contained vanadium, f.o.b. furnace	$3.15 to $3.65
Ferrocarbontitanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads	$160.00
Ferrophosphorus, electric or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton	$91.00
Ferrophosphorus, electric 24%, f.o.b. Anniston, Ala., per gross ton	$122.50

Fluxes and Refractories

Fluorspar

	Per Net Ton
Domestic, 85% and over calcium fluoride, not over 5% silicon, gravel, f.o.b. Illinois and Kentucky mines	$18.00
No. 2 lump, Illinois and Kentucky mines	20.00
Foreign, 85% calcium fluoride, not over 5% silica, c.i.f. Atlantic port, duty paid	$18.00 to $18.50
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silica, f.o.b. Illinois and Kentucky mines	32.50

Fire Clay Brick

	Per 1000 f.o.b. Works	
	High-Heat Duty Brick	Intermediate Heavy Duty Brick
Pennsylvania	$43.00 to $46.00	$35.00 to $38.00
Maryland	43.00 to 46.00	35.00 to 38.00
New Jersey	50.00 to 65.00	.....
Ohio	43.00 to 46.00	35.00 to 38.00
Kentucky	43.00 to 46.00	35.00 to 38.00
Missouri	43.00 to 46.00	35.00 to 38.00
Illinois	43.00 to 46.00	35.00 to 38.00
Ground fire clay, per ton	7.00	

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$43.00
Chicago	52.00
Birmingham	50.00
Silica clay, per ton	$8.50 to 10.00

Magnesite Brick

	Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa.	$65.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00
Standard size	45.00

Chrome Brick

	Per Net Ton
Standard size	$45.00

Mili Prices of Bolts, Nuts, Rivets and Set Screws

Bolts and Nuts

Per 100 Pieces

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
†Machine bolts	70
†Carriage bolts	70
Lag bolts	70
Plow bolts, Nos. 1, 2, 3 and 7 heads	70
Hot-pressed nuts, blank or tapped, square	70
Hot-pressed nuts, blank or tapped, hexagons	70
C.p.c. and t. square or hex. nuts, blank or tapped	70
Washers*	7.00c. to 6.75c. per lb. off list

*F.o.b. Chicago, New York and Pittsburgh.

†Bolts with rolled thread up to and including ¼ in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts

	Per Cent Off List
Semi-finished hexagons nuts	70
Semi-finished hexagons castellated nuts, S.A.E.	70
Stove bolts in packages, Pittsburgh	80, 10 and 5
Stove bolts in packages, Chicago	75, 20, 10 and 5
Stove bolts in packages, Cleveland	75, 20 10 and 5
Stove bolts in bulk, Pittsburgh	80, 10, 5 and 2½
Stove bolts in bulk, Chicago	75, 20, 10, 5 and 2½
Stove bolts in bulk, Cleveland	75, 20, 10, 5 and 2½
Tire bolts	60, 5 and 5

Discounts of 70 per cent off on bolts and nuts applied on carload business. For less than carload orders discounts of 55, 60 per cent apply.

Large Rivets

(½-In. and Larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$3.10
F.o.b. Chicago	3.20

Small Rivets

(⅞-In. and Smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70 and 10
F.o.b. Cleveland	70 and 10
F.o.b. Chicago	70 and 10

Cap and Set Screws

(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screws	80, 10 and 5
Milled standard set screws, case hardened	80 and 5
Milled headless set screws, cut thread	75 and 10
Upset hex. head cap screws, U.S.S. thread	85
Upset hex. cap screws, S.A.E. thread	85
Upset set screws	80, 10 and 5
Milled studs	70

Chicago

Current Prices on Plates, Shapes and Bars Extended to Third Quarter—Large Carryover of Tonnage

CHICAGO, June 4.—Chicago producers are reaffirming prices on plates, shapes and bars for third quarter delivery at 2.05c. to 2.15c. a lb. A large tonnage of finished steel now on producers' books will be carried into the coming quarter because of inability of mills to meet demands of consumers.

Consumption in this district remains at a high level, industry in general showing little change, with the single exception of automobile companies, which are curtailing production schedules. Specifications, taken as a whole, still match shipments, and deliveries show no improvement. New buying is quiet and as a result mill order books are smaller than a week ago.

Figures now available show that production of finished steel in May lacked only a small percentage of being equal to the record month for all time, and it was without question the best May in the history of Chicago mills. The outlook for June is considered unusually favorable.

Some take the stand that a decline in the demand for some steel products would not be seriously felt because other lines, principally plates and rails, will readily absorb any excess ingot capacity. Therefore, mills are reasonably assured a high rate of output this month.

Secondary rail buying totals 12,000 tons. Production of rails and track supplies is as heavy as the curtailed supply of semi-finished steel will permit. A turn for the better is indicated in the building construction field. A strike of structural steel erectors, however, is delaying shipments against old contracts.

Ferroalloys.—The spiegeleisen market is quiet. Prices are steady at $34 a ton in carloads and $32 a ton in large lots, Hazard, Pa. The ferromanganese market is dull from the viewpoint of sales, but shipments are large.

Prices delivered Chicago: 80 per cent ferromanganese, $112.56; 50 per cent ferrosilicon, $83.50 to $88.50; spiegeleisen, 19 to 21 per cent, $40.76.

Pig Iron.—With fully 70 per cent of third quarter iron sold, a lull in new buying has come. Shipments are at a steady rate except to malleable foundries, which are curtailing output to adjust to the lighter production of automobiles. The total volume of forward purchases up to the opening week of June is not as heavy as at the beginning of the month preceding the opening of the second quarter. The arrival of a cargo of iron from a Lake Erie port makes the sixth boatload that has come to this district since the opening of navigation. Foremost among silvery sales was one lot of 500 tons. Shipments of this commodity are large.

Prices per gross ton at Chicago:

N'th'n No. 2 fdy., sil. 1.75 to 2.25	$20.00
N'th'n No. 1 fdy., sil. 2.25 to 2.75	20.50
Malleable, not over 2.25 sil.	20.00
High phosphorus	20.00
Lake Super. charcoal, sil. 1.50	27.04
So'th'n No. 2 fdy. (all rail)	$21.01 to 21.51
Low phos., sil. 1 to 2, copper free	29.50
Silvery, sil. 8 per cent	30.79
Bess. ferrosilicon, 14-15 per cent	46.29

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnace, not including an average switching charge of 61c. per gross ton.

Cast Iron Pipe.—Contractors are finding more work, but the bulk of it is in outlying territory. Large sales are lacking, and carload orders are more spotty than a week ago. Some sellers believe that many municipalities which held elections this spring will come into the market by midsummer. Scattered orders for less than carload lots are coming from railroads that have water treatment plants on summer construction programs. The McWane Cast Iron Pipe Co. has taken 9500 ft. of 6-in. pipe for Muskegon, Mich., and 115 tons of 4 to 8-in. pipe for Irwin, Iowa. Lexington, Ohio, has ordered 200 tons of 4 and 6-in. pipe from the Central Foundry Co. Oak Park, Ill., is said to have placed 200 tons of 6 to 12-in. pipe with the Lynchburg Foundry Co. Among new inquiries are 30,000 ft. of 6-in. pipe for Woodville, Ohio, an unstated tonnage for Danville, Ill., and 28,000 ft. each of 6 and 8-in. pipe for Canton, Ohio.

Prices per net ton, del'd Chicago: Water pipe, 6-in. and over, $44.20 to $46.20; 4-in., $48.20 to $50.20; Class A and gas pipe, $3 extra.

Rails and Track Supplies.—Two railroads operating out of Chicago have taken additional rails to the extent of 12,000 tons. One purchase amounted to 10,000 tons. Orders for fastenings total 2500 tons, and fresh inquiry is developing. Western rail mills are operating at 85 per cent of capacity, a rate still governed by the supply of semi-finished steel. Track supply departments are engaged at close to full rating. The light rail market is dull. Chicago mills do not expect to participate in the orders for 40,000 tons of standard-section rails wanted by the Southern Pacific. It is reported here that this business will be divided among the Colorado mill and producers in the South and East.

Prices f.o.b. mill, per gross ton: Standard section open-hearth and Bess. rails, $43; light rails, rolled from billets, $36. *Per lb.:* Standard railroad spikes, 2.80c.; track bolts with square nuts, $3.80c.; steel tie plates, 2.15c.; angle bars, 2.75c.

Sheets.—New buying in sheets is brisk, considering that June is usually one of the dullest months of the year. Specifications are not as heavy as a week ago. Deliveries are somewhat improved. Galvanized sheets may now be had in two to three weeks, black in four weeks, while blue annealed steel is scheduled at seven to eight weeks. Demand by the roofing trade showed marked improvement in May. The total tonnage exceeded that of the fifth month in 1928, but it did not measure up to shipments in the corresponding months of years previous to that. Three days of hot weather in the past week cut output at local mills. Operations remain at 85 per cent of capacity.

Base prices per lb., deliv'd from mill in Chicago: No. 24 black sheets, 3.10c.; No. 24 galv., 3.85c.; No. 10 blue ann'l'd, 2.35c. Deliv'd prices at other Western points are equal to the freight from Gary, plus the mill prices, which are 5c. per 100 lb. lower than Chicago delivered prices.

Reinforcing Bars.—This market continues to show improvement. The general outlook now is better than at any time this year. Estimating departments have more work on hand than in many months. Although the pending list is growing, it still is measurably behind that of a year ago. The Illinois Central soon may come into the market for bars for track depression work on its South Chicago branch. Indiana highway work is gaining headway, but in Illinois road work is almost at a standstill. Prices for reinforcing bars are unchanged except for a slight strengthening in quotations for the billet steel commodity. Shop output is somewhat heavier.

Wire Products.—Sales of wire and wire products in May were in exceptionally good volume because of a retarded demand earlier in the spring. As June starts, buying by consumers is well sustained—a condition contrary to expectations of producers who usually find June a dull month. Specifications are lighter, and mill operations have been reduced several points to 70 per cent of capacity. Reports from most sections of the country indicate that stocks in the hands of users are small, and it develops that producers' stocks, with the exception of nails, have been sharply cut in recent weeks. Demand from the jobbing trade is well sustained, considering the lateness of the season. Slightly smaller shipments are being made to automobile manufacturers.

Warehouse Prices, f.o.b. Chicago

	Base per Lb.
Plates and structural shapes	3.10c.
Soft steel bars	3.00c.
Reinforc'g bars, billet steel	2.10c. to 2.40c.
Reinforc'g bars, rail steel	1.90c. to 2.05c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons	3.60c.
Flats and squares	4.10c.
Bands (7/8 in. in Nos. 10 and 12 gages)	3.20c.
Hoops (No. 14 gage and lighter)	3.75c.
Black sheets (No. 24)	4.05c.
Galv. sheets (No. 24)	4.90c.
Blue ann'l'd sheets (No. 10)	3.35c.
Spikes, 7/8 in. and larger	3.55c.
Track bolts	4.55c.
Rivets, structural	4.00c.
Rivets, boiler	4.00c.

	Per Cent Off List
Machine bolts	60
Carriage bolts	60
Coach or lag screws	60
Hot-pressed nuts, sq., tap. or blank	60
Hot-pressed nuts, hex., tap. or blank	60
No. 8 black ann'l'd wire, per 100 lb.	$3.45
Com. wire nails, base per keg	3.20
Cement c't'd nails, base per keg	3.20

Cold-Rolled Strips.—Forward contracting is gaining headway at prices that are unchanged. Specifications are large and support output at near capacity. Deliveries are from four to eight weeks.

Structural Material.—This week gives signs of being the turning point in a market which has been unusually dull. Awards total more than 4000 tons, 2800 tons of which is for an addition to a central Illinois farm implement manufacturing plant. Several projects in Chicago are expected to be closed at an early date. Among new inquiries is one for 1000 tons for a garage in Chicago. Efforts to finance new buildings are not always successful, partly because of an overbuilt condition in many types of structures. It is estimated here that there is an excess of 19 per cent in office space. A strike called last week by Chicago structural iron and steel workers has temporarily halted all active construction programs.

Mill prices on plain material, per lb.: 2.05c. to 2.15c. base, Chicago.

Plates.—New buying continues in moderate volume and at prices which have held in recent months. Although Western mills have not made official announcements as to third quarter prices, it is generally understood by the trade that there will be no changes. Prior to the last advance, which was at the beginning of the second quarter, many buyers had covered for that period at quotations that averaged $1 a ton lower than the present level. To those consumers, present prices at 2.05c. to 2.15c. a lb., Chicago, will represent an advance. The carryover tonnage from second quarter contracts will be unusually large on account of producers' inability to meet demands. This fact is looked upon by some as one of the most important factors entering into policies of adhering to present prices for the next three months. Specifications from car builders are large and shop schedules are well filled for the summer months. One car builder which long has had one unit out of service has been considering building cars again at that shop, but has finally dropped the idea because of inability to get ample shipments of steel. There is no change in the rate of specifying for pipe manufacture. Tank builders show no hesitancy in taking their full allotments of plates. It is reported here that a refiner in the West has ordered 4000 tons of materials for tanks from Pacific Coast sellers.

Old Material.—The Chicago scrap market is quiet and steady, with dealers confining most of their efforts to filling old orders. Prices, in the absence of sales to consumers, are somewhat nominal. Brokers' trades reflect stronger prices for some specialties and lower prices for others. Supplies appear to be adequate in most grades, though in some cases incoming shipments are in balance with the needs of consumers. Sellers find little difficulty in disposing of scrap as it appears on tracks. In some cases, brokers are willing to pay premiums for a few carloads to be applied against contracts that are near expiration. Rejections are less numerous, not, however, because mills are less particular, but because sellers are using greater caution in grading scrap. The foundry trade remains quiet in new sales. Except in a few instances where contracts for automobile parts are being completed, shipments of scrap to melters are unchanged from the rate of recent weeks. There are indications that some buyers are inclined to wait out the market as far as possible, with the thought that lower prices may soon prevail. Among railroad offerings are 6000 tons by the St. Paul and 5000 tons by the Chicago & North Western.

Prices deliv'd Chicago district consumers:

Per Gross Ton	
Basic Open-Hearth Grades:	
Heavy melting steel	$15.00 to $15.50
Shoveling steel	15.00 to 15.50
Frogs, switches and guards, cut apart, and misc. rails	16.75 to 17.25
Hydraul. compressed sheets	13.50 to 14.00
Drop forge flashings	11.00 to 11.50
No. 1 busheling	13.25 to 13.75
Forg'd cast and r'l'd steel carwheels	18.50 to 19.00
Railroad tires, charg. box size	18.50 to 19.00
Railroad leaf springs cut apart	18.50 to 19.00
Acid Open-Hearth Grades:	
Steel couplers and knuckles	16.75 to 17.25
Coil springs	19.00 to 19.50
Electric Furnace Grades:	
Axle turnings	15.50 to 16.00
Low phos. punchings	17.00 to 17.50
Low phos. plates, 12 in. and under	16.50 to 17.00
Blast Furnace Grades:	
Axle turnings	11.00 to 11.50
Cast iron borings	10.00 to 10.50
Short shoveling turnings	10.00 to 10.50
Machine shop turnings	7.25 to 7.75
Rolling Mill Grades:	
Iron rails	16.00 to 16.50
Rerolling rails	17.50 to 18.00
No. 1 busheling	9.00 to 9.50
Cupola Grades:	
Steel rails less than 3 ft.	18.50 to 19.00
Steel rails less than 2 ft.	19.00 to 19.50
Angle bars, steel	17.00 to 17.50
Cast iron carwheels	14.50 to 15.00
Malleable Grades:	
Railroad	18.00 to 18.50
Agricultural	15.75 to 16.25
Miscellaneous:	
*Relaying rails, 56 to 60 lb.	23.00 to 25.00
*Relaying rails, 65 lb. and heav.	26.00 to 31.00
Per Net Ton	
Rolling Mill Grades:	
Iron angles and splice bars	15.00 to 15.50
Iron arch bars and transoms	21.50 to 22.00
Iron car axles	26.50 to 27.00
Steel car axles	17.00 to 17.50
No. 1 railroad wrought	14.00 to 14.50
No. 2 railroad wrought	13.50 to 14.00
No. 2 busheling	7.00 to 7.50
Locomotive tires, smooth	14.50 to 15.00
Pipes and flues	10.00 to 10.50
Cupola Grades:	
No. 1 machinery cast	15.00 to 15.50
No. 1 railroad cast	14.00 to 14.50
No. 1 agricultural cast	13.50 to 14.00
Stove plate	12.25 to 12.75
Grate bars	12.50 to 13.00
Brake shoes	11.50 to 12.00

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

Bars.—Buying of soft steel bars for third quarter is in moderate volume at 2.05c. to 2.15c. Specifications are lighter than a week ago, as the demands from automobile manufacturers gradually grow less. In general, deliveries from local mills are not better than 12 to 14 weeks, and the inflow of bars to this territory from other producing centers is unabated. A number of agricultural implement manufacturers are now taking inventory, but there is no lessening in the demand for steel from that source. On the whole, industry in this district continues at a high rate of output, with the single exception of that part of it which manufactures for automobile builders. It is noteworthy that the decline in that direction is at a slow pace and has not reached as low a level as many had predicted for the first week in June. Forward buying in alloy steel bars is active; prices are firm. Chicago mills continue to operate at capacity, and current specifications amply support this rate of output. Sales of iron bars are in moderate volume, and shipments are undiminished. Consumers of rail steel bars are closing for third quarter requirements at 1.95c. a lb., Chicago Heights. New business and production in May were fully equal to the previous month's figures, and the prospects are good, as mills enter June with the heaviest backlogs in some time. Both Chicago Heights mills are operating on a double-turn basis. The mill at Moline will go down June 15 for extensive repairs.

Bolts, Nuts and Rivets.—Third quarter contracts are being passed among buyers at unchanged prices. Specifications from tractor manufacturers are growing heavier. Other industries, with the exception of automobile makers, are taking undiminished quantities.

Coke.—Shipments of by-product foundry coke remain heavy. All ovens in this district are lighted. Most of the last half contracts are covered. Prices are firm at $8 a ton, f.o.b. Chicago furnaces, and $8.75 a ton, delivered in the Chicago switching district.

To execute a roofing contract for new shops of the Rio de Janeiro Tramway, Light & Power Co., Ltd., of Brazil, the American Cement Tile Mfg. Co., Pittsburgh, decided to make the Cementile on the ground. Since 500,000 sq. ft. of roofing is involved and water shipments were deemed impractical because of the necessity for crating, complete equipment to manufacture the tile was shipped to Rio de Janeiro. Work will be completed in eight to 10 months.

Gray and malleable iron jobbing foundries of Worcester, Mass., and vicinity, produced 4,916,263 lb. of castings in April, compared with 3,504,179 lb. in April, 1928, an increase of 40 per cent, which was the largest gain, compared with a year ago, of any month of the year to date. Total output of the four months was 18,116,716 lb., a gain of 34 per cent over 1928.

J. E. Moss Iron Works, Wheeling, W. Va., structural steel fabricator, has changed its name to Wheeling Structural Co., effective June 1.

New York

No Widespread Interest in Third Quarter Pig Iron—Steel Orders in Steady Flow

NEW YORK, June 4.—Pig iron business is still in small volume, sales for the week totaling 7000 tons. A few melters are sounding out the market for their third quarter, one of them for 2000 tons and another for 500 tons, but interest in iron for that period is not widespread. A considerable number of foundries that use Indian iron in their mixtures have placed orders ahead to permit the importer to arrange for the shipment of a cargo, but their attitude toward their main requirements, which they obtain from domestic furnaces, is apathetic. So far as can be learned melt is well maintained in this district and relatively little second quarter iron will be carried over into the next period, but buyers evidently feel that it is to their advantage to wait. They have been encouraged in this view, perhaps, by the reduction in rail-and-water freight rates from Alabama, with its promise of increased competition on the part of Southern producers. While the new rates are scheduled to go into effect July 5, protests by Northern interests may result in their suspension pending review by the Interstate Commerce Commission. Northern furnaces have relatively low stocks, but buyers count on increasing pressure to sell as the summer dip in steel business approaches. In this connection it is noteworthy that a steel works interest that has been relatively inactive in the merchant iron market for some time is again taking sizable orders. A cargo of Dutch iron has arrived at Bridgeport, Conn., most of it presold. Dutch foundry iron is quoted at $22.50, duty paid, port of entry, for No. 1X and lower grades. Indian foundry iron ranges from $21.50 to $22, base, duty paid. On domestic foundry irons delivered prices figure back to $18, base Buffalo. The sale of charcoal iron by a Michigan consumer at $24, delivered, reported last week, was from the stock of a furnace that is being dismantled and therefore has no general market significance.

Prices per gross ton, delivered New York district:

Buffalo No. 2, fdy., sil. 1.75 to 2.25	$22.91 to $23.91
*Buf. No. 2, del'd east. N. J.	21.28 to 22.28
East. Pa. No. 2 fdy., sil. 1.75 to 2.25	21.39 to 22.52
East. Pa. No. 2X fdy., sil. 2.25 to 2.75	21.89 to 23.02

Freight rates: $4.91 from Buffalo, $1.39 to $2.52 from eastern Pennsylvania.

*Price delivered to New Jersey cities having rate of $3.28 a ton from Buffalo.

Reinforcing Bars. — Most current lettings are small, calling for less than 100 tons each, but the aggregate volume of business is on a par with what it was a year ago for some distributers and not far short of that level for others. A large tonnage of bars will be required for additional New York subway work, on which bids are now being taken. Reinforcing bar prices are stiffer, and there is some talk of a formal advance in quotations, possibly as much as $2 a ton.

Billet steel reinforcing bars in 40, 50 and 60-ft. lengths, 2.05c. per lb., Pittsburgh, and 2.30c. per lb., Pittsburgh warehouse, for cut lengths. Out of New York warehouse, 2.90c. per lb. for lots of 5 tons or more, 3.05c. for lots of 2 to 5 tons and 3.30c. for less than 2 tons, all delivered at job.

Finished Steel.—A second section of the West Side elevated highway, New York, will be out for bids next week. The steel requirements will be about the same as for the first section, recently let, which took 22,500 tons. Structural work continues an important feature of the local steel market. Steel companies report no falling off in the volume of specifications from consumers and jobbers. The demand for bars and sheets is especially good. Although Eastern plate mills are well supplied with orders, this district is not furnishing its usual proportion of the rollings. Except for the changes already announced on blue annealed sheets, price advances for the third quarter do not appear to be in prospect. The American Locomotive Co. has received a large order for tanks which will be fabricated at its plant at Dunkirk, N. Y.

Mill prices per lb., deliv'd New York: Soft steel bars, 2.29c.; plates, 2.22½c.; structural shapes, 2.19½c.; bar iron, 2.14c.

Warehouse Business. — The past month compared favorably with April in the total of business. Demand for structural material and bars is steady. Jobbers have not yet adopted separate bases for blue annealed sheets and light plates.

Cast Iron Pipe. — Purchases of pressure pipe are limited to small orders for a few hundred tons each. The New Haven Water Co., New Haven, Conn., is reported to be preparing an inquiry for several thousand tons of 40-in. water pipe. Recent purchases of pipe have included 200 tons for West Virginia by the Federal Water Service Co., New York, and 400 tons for Texas by the Texas Co., New York, both from a Birmingham maker. Prices are still irregular, depending upon the size of the inquiry and the tonnage on the books of the foundries bidding. Port Washington, N. Y., has awarded 900 tons of water pipe to the Warren Foundry & Pipe Co.

Prices per net ton deliv'd New York: Water pipe, 6-in. and larger, $35.60 to $36.60; 4-in. and 5-in., $38.60 to $39.60; 3-in., $45.60 to $46.60. Class A and gas pipe, $3 extra.

Coke.—Demand for furnace coke has declined slightly, and the market is unchanged at $2.75 to $2.85 per net ton, Connellsville. Special brands of beehive coke are firm at $4.85 per net ton, ovens, or $8.56, delivered to northern New Jersey, Jersey City and Newark, and $9.44 to New York and Brooklyn. By-product coke is quoted at $9 to $9.40 per net ton, Newark or Jersey City, and $10.06, New York or Brooklyn.

Old Material.—Buying prices of No. 1 heavy melting steel range from $15.50 to $16 per ton, delivered east-

Warehouse Prices, f.o.b. New York

	Base per Lb.
Plates and structural shapes	3.30c.
Soft steel bars, small shapes	3.25c.
Iron bars	3.24c.
Iron bars, Swed. charcoal	7.00c. to 7.25c.
Cold-fin. shafting and screw stock—	
Rounds and hexagons	3.60c.
Flats and squares	4.10c.
Cold-roll. strip, soft and quarter hard	5.15c. to 5.40c.
Hoops	4.25c.
Bands	3.75c.
Blue ann'l'd sheets (No. 10)	3.85c. to 3.90c.
Long terne sheets (No. 24)	5.80c.
Standard tool steel	12.00c.
Wire, black annealed	4.50c.
Wire, galv. annealed	5.15c.
Tire steel, 1½ x ½ in. and larger	3.30c.
Smooth finish, 1 to 2½ x ¼ in. and larger	3.65c.
Open-hearth spring steel, bases,	4.50c. to 7.00c.

	Per Cent Off List
Machine bolts, cut thread:	
¾ x 6 in. and smaller	60
1 x 30 in. and smaller	50 to 50 and 10
Carriage bolts, cut thread:	
½ x 6 in. and smaller	60
¾ x 20 in. and smaller	50 to 50 and 10
Coach screws:	
½ x 6 in. and smaller	60
1 x 6 in. and smaller	50 to 50 and 10

Boiler Tubes—	Per 100 Ft.
Lap welded, 2-in.	$17.33
Seamless steel, 2-in.	20.24
Charcoal iron, 2-in.	25.00
Charcoal iron, 4-in.	67.00

Discounts on Welded Pipe

Standard Steel—	Black	Galv.
⅛-in. butt	46	29
¼-in. butt	51	37
⅜-in. butt	53	39
½-6-in. lap	48	35
7 and 8-in. lap	44	17
11 and 12-in. lap	37	12
Wrought Iron—		
⅛-in. butt	5	+19
¼-in. butt	11	+ 9
⅜-1½-in. butt	14	+ 6
2-in. lap	5	+14
3-6-in. lap	11	+ 6
7-12-in. lap	3	+16

Tin Plate (14 x 20 in.)

	Prime	Seconds
Coke, 100 lb. base box	$6.45	$6.20
Charcoal, per Box—	A	AAA
IC	$9.70	$12.10
IX	12.00	14.25
IXX	13.90	16.00

Terne Plate (14 x 20 in.)

IC—20-lb. coating	$10.00 to $11.00
IC—30-lb. coating	12.00 to 13.00
IC—40-lb. coating	13.75 to 14.25

Sheets, Box Annealed—Black, C. R. One Pass

	Per Lb.
Nos. 18 to 20	3.80c.
No. 22	3.95c.
No. 24	4.00c.
No. 26	4.10c.
No. 28*	4.25c.
No. 30	4.50c.

Sheets, Galvanized

	Per Lb.
No. 14	4.40c.
No. 16	4.25c.
No. 18	4.40c.
No. 20	4.50c.
No. 22	4.60c.
No. 24	4.75c.
No. 26	5.00c.
No. 28*	5.25c.
No. 30	5.65c.

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

ern Pennsylvania, brokers with recent contracts offering the lower prices. Yard grade of heavy melting steel is quiet, and prices are unchanged at $12 to $13 per ton, delivered. Brokers report a good supply of specification pipe, at $15 per ton, delivered.

Dealers' buying prices per gross ton, f.o.b. New York:

No. 1 heavy melting steel	$12.00 to $13.35
Heavy melting steel (yard)	8.25 to 9.25
No. 1 hvy. breakable cast.	11.25 to 12.00
Stove plate (steel works).	7.75 to 8.25
Locomotive grate bars....	8.25 to 8.75
Machine shop turnings....	7.25 to 7.50
Short shoveling turnings..	7.25 to 7.50
Cast borings (blast furn. or steel works)	7.00 to 7.25
Mixed borings and turnings	6.75 to 7.25
Steel car axles	19.25 to 19.75
Iron car axles	24.00 to 25.00
Iron and steel pipe (1 in. dia., not under 2 ft. long)	11.25
Forge fire	9.50 to 10.00
No. 1 railroad wrought....	12.00 to 12.50
No. 1 yard wrought, long..	11.00 to 11.50
Rails for rolling	13.00 to 13.50
Cast iron carwheels	12.00 to 12.25
Stove plate (foundry)....	8.50 to 9.00
Malleable cast (railroad).	14.00 to 14.50
Cast borings (chemical)..	10.00 to 10.50

Prices per gross ton, deliv'd local foundries:

No. 1 machry. cast.....	$17.00
No. 1 hvy. cast (columns, bldg. materials, etc.), cupola size.....	15.00
No. 2 cast (radiators, cast boilers, etc.)	14.50

Republic Now Electrically Welding Pipe Up to 7 In.

The Republic Iron & Steel Co. is now producing steel pipe by the electric welding method, having completed installation of a machine which will roll tubing up to 7 in. in diameter. The mill is now in satisfactory operation. Two similar mills, which will roll pipe up to 21 in., have been ordered.

Installation of machinery in the Buffalo plant of Bliss & Laughlin, Inc., is now practically completed and the company is equipped to take steel user. The site covers approxicare of every need of the cold drawn mately eight acres of land; 90 men are employed now and the plant is operating under the direct supervision of Walter R. Howell, vice-president, and Leonard J. Kelly, general manager. Sales in the Buffalo, Rochester, Syracuse territory are being handled by Brace-Mueller-Huntley, Inc. The plant represents an investment of more than $1,000,000.

Muller Railway Track Systems, Inc., Metropolitan Bank Building, Washington, recently incorporated with capital stock of $500,000, has arranged with some of the steel mills for the manufacture of its patented joint bars, base plates, holding keys and spike pins for use on railroads. The company's rail joint bar has been on test on the Baltimore & Ohio Railroad on its main lines between Washington and Baltimore for more than a year. The rail joint bars can be manufactured from steel castings, drop forgings or rolled steel.

Cleveland

Lessened Pressure From Automobile Industry Will Not Materially Affect June Steel Output

CLEVELAND, June 4.—While there has been a little slowing down in the demand for steel, the tonnage entered in May held up close to that in April, and mills now have enough business on their books to assure their full operation through the present month. Consumers have placed good specifications for June shipment against contracts for steel bars, plates and structural material, and deliveries on these products show no improvement. Indications are that mills will have little unspecified tonnage on their books at the end of June.

Deliveries have improved considerably on auto body sheets and to a lesser extent on other grades of sheets and on alloy steel bars and hot and cold-rolled strip. There has been some contracting for the third quarter at the reestablished price for strip steel, manufacturers' wire and cold-finished steel bars. No announcement of third quarter prices on steel bars, plates and shapes has been made, but it is expected that present prices will be established.

Some of the automobile manufacturers have covered for their July requirements, but as yet are not going beyond that month. Releases of orders to makers of automobile parts, stampings, forgings and other parts show a decrease, indicating a further curtailment in operations by some of the automobile manufacturers. However, the June production of cars is expected to show only a moderate decline from May, and it seems probable that leading makers of low-priced cars will maintain their present high production schedules for an indefinite period.

Structural inquiry continues light. Reinforcing bars are in fair demand in small lots.

Prices are firm at 1.95c. to 2c., Cleveland, for steel bars and 1.95c., Pittsburgh, for plates and structural material.

Pig Iron.—Sales of foundry and malleable iron increased considerably the past week. Cleveland interests booked 21,000 tons, or nearly twice as much as during the previous week. Inquiry also is more plentiful. The larger volume of business indicates a more general interest in third quarter requirements. While considerable of the business was for that delivery, there was an increase in small-lot orders for early shipment to foundries that will need additional iron during June, but are not ready to buy for the third quarter. These evidently are delaying purchasing because they do not know what their requirements will amount to during the coming quarter rather than because of any expectation of lower prices. On the other hand, they are not worried over any possibility of an advance. Automobile foundries are still refraining from buying for the coming quarter. Some of the jobbing foundries started the month with less business on their books than at the beginning of May and, with the curtailment by some of the automobile companies, a moderate decline in shipping orders is expected this month. Cleveland prices are firm at the recent quotations of $18.50, furnace, for outside shipment and $19 for local delivery. Other Lake furnaces quote $19. In Michigan, there is a range of $20 to $20.50, depending on point of shipment.

Prices per gross ton at Cleveland:

N'th'n fdy., sil. 1.75 to 2.25	$19.50
S'th'n fdy., 1.75 to 2.25	$21.00 to 21.50
Malleable	19.50
Ohio silvery, 8 per cent...	29.00
Basic Valley furnace.....	18.50
Stand. low phos., Valley..	26.50 to 27.00

Prices except on basic and low phosphorus are delivered Cleveland. Freight rates: 50c. from local furnaces; $3 from Jackson, Ohio; $6 from Birmingham.

Iron Ore.—Shipments of Lake Superior ore by water during May broke all previous records for the month. The movement was 9,549,273 gross tons. The best previous record for May was in 1918, when 8,792,231 tons were shipped. The May movement was an increase of 4,186,458 tons over the corresponding month last year. Previous records for the movement until June 1 were also broken. Shipments up to that date were 12,065,514 tons, an increase of 6,696,753 tons over the corresponding period last year. Most of the ore last month was shipped to furnaces. Dock shipments to consumers broke all previous records for May.

Semi-Finished Steel.—While there is less pressure on the part of consumers for material, deliveries show only a very slight improvement, and June specifications are holding close to the volume of last month. The present price of $42, Cleveland and Pittsburgh, has been reaffirmed on wire rods. No announcement has been made on third quarter prices of sheet bars, billets and slabs. If mills continue to hold to the present price of $36, Cleveland and Youngstown, for

Warehouse Prices, f.o.b. Cleveland

	Base per Lb.
Plates and struc. shapes.....	3.00c.
Soft steel bars	3.00c.
Reinforc. steel bars.....2.25c. to	2.50c.
Cold-fin. rounds and hex.....	3.65c.
Cold-fin. flats and sq.....	4.15c.
Hoops and bands, No. 12 to $\frac{1}{4}$ in., inclusive	3.25c.
Hoops and bands, No. 13 and lighter	3.65c.
Cold-finished strip .....*5.95c.	
Black sheets (No. 24).....3.70c. to	3.90c.
Galvanized sheets (No. 24).4.60c. to	4.75c.
Blue ann'l'd sheets (No. 10).....	3.25c.
No. 9 ann'l'd wire, per 100 lb.....	$2.95
No. 9 gal. wire, per 100 lb.....	3.40
Com. wire nails, base per keg.....	2.95

*Net base, including boxing and cutting to length.

the coming quarter, it will be equivalent to an advance, as practically all consumers covered for this quarter at lower prices.

Bolts, Nuts and Rivets.—Shipments of bolts and nuts during May were approximately the same as in April, but incoming orders have declined about 10 per cent, so that June will show a falling off. The decrease in volume is pretty well distributed among various industries. Manufacturers are now sending out contract forms for the third quarter at the restablished prices. Present rivet prices of $3.10, Cleveland or Pittsburgh, for large rivets and 70 and 10 per cent off list for small rivets will be reestablished for the third quarter by the leading local manufacturer. However, formal announcement of the prices made will not be sent out until later in the month.

Strip Steel. — Specifications show some falling off, and deliveries on both hot and cold-rolled strip have improved with most of the mills. Hot-rolled material can be purchased for shipment within two or three weeks, although most mills are filled up on both grades through June. While some third quarter contracts have been placed at the reestablished prices, buyers seem in no hurry to get under cover. Some orders for fender stock have been placed for July shipment.

Sheets.—Orders for all grades of sheets have fallen off, although this is most noticeable in auto body sheets, and pressure for deliveries has subsided. While deliveries on common black sheets can be secured in two or three weeks, most mills are fully committed through June and some have considerable tonnage on their books for July shipment. Consequently, little slowing down in production is looked for this month. Little interest is being shown as yet in third quarter contracts. Some of the automobile companies have placed orders for July shipment, but not for more extended delivery. Steel barrel manufacturers report a decline in their business. An inquiry for 15,000 tons of black sheets is pending from a manufacturer of building material. With the lessened demand, there is increased evidence of shading black sheets to 2.85c., Pittsburgh. Galvanized sheets are also being shaded $2 a ton to 3.60c.

Wire Products.—A number of large consumers have placed contracts for manufacturers' wire for the third quarter, following the reestablishment of the second quarter prices. While resistance to the 2.50c. price was met, it is stated that all contracts were taken at that price, although there are persistent reports that current orders can be placed at 2.40c. Contracting for nails has not started for the coming quarter and the demand continues rather slow.

Cold-Finished Steel Bars. — Books have been opened for the third quarter at the present price of 2.35c., Cleveland, and some contracts have been closed. Specifications continue good.

Warehouse Business. — Business is holding up to recent volume. There is a very active demand for small shapes and other sections on which mill deliveries are considerably extended. Sheets are also moving well from stock.

Coke.—Orders for foundry coke are not quite so heavy as last month, as some of the jobbing foundries are not as busy as they have been. Prices are unchanged. Ohio by-product coke is quoted at $8.25, Painesville.

Old Material.—The market continues very dull. Activity during the week was limited to small-lot purchases by dealers. Local mills have large stocks and are not taking much scrap against outstanding contracts with dealers. One consumer is still receiving heavy water shipments from Detroit, which is affecting the local market. While the market has a weak tone, prices have not been reduced. There is some demand for blast furnace grades, for which dealers are paying $11.25. In the Valley district, dealers are paying $17.25 for No. 1 heavy melting steel and $16.75 to $17 for compressed steel.

Prices per gross ton delivered consumers yards:

Basic Open-Hearth Grades	
No. 1 heavy melting steel	$15.25 to $15.75
No. 2 heavy melting steel	15.00 to 15.50
Compressed sheet steel	15.00 to 15.50
Light bundled sheet stampings	12.00 to 12.50
Drop forge flashings	13.00 to 13.25
Machine shop turnings	9.25 to 9.50
No. 1 railroad wrought	13.50 to 14.00
No. 2 railroad wrought	16.00 to 16.50
No. 1 busheling	13.00 to 13.50
Pipes and flues	9.00 to 9.50
Steel axle turnings	12.50 to 13.00
Acid Open-Hearth Grades	
Low phos., forging crops	17.75 to 18.00
Low phos., billet, bloom and slab crops	18.50 to 18.75
Low phos., sheet bar crops	18.00 to 18.50
Low phos. plate scrap	18.00 to 18.50
Blast Furnace Grades	
Cast iron borings	11.00 to 11.50
Mixed borings and short turnings	11.00 to 11.50
No. 2 busheling	11.00 to 11.50
Cupola Grades	
No. 1 cast	17.25 to 17.50
Railroad grate bars	11.00 to 12.00
Stove plate	12.00 to 12.50
Rails under 3 ft	16.75 to 17.25
Miscellaneous	
Railroad malleable	18.00 to 18.50
Rails for rolling	16.25 to 16.50

Reinforcing Steel

Awards of More Than 8000 Tons —Two Hospitals Require 1300 Tons

THE largest award included in the total for the week of more than 8000 tons was 4000 tons for a Columbia - Wrightsville, Pa., bridge. An apartment in Chicago and a grain elevator in Minneapolis each required 600 tons of bars. In a total of almost 2500 tons of new projects is about 700 tons in buildings for a United States Veterans' Hospital at Coatesville, Pa., and about 600 tons in a similar hospital development at Somerset Hills, N. J.

NEW YORK, 100 tons, foundations for addition to International Telephone & Telegraph Co. building, to Concrete Steel Co.

NEW YORK, 100 tons, Bank of Manhattan, to Concrete Steel Co.

BROOKLYN, 300 tons, Pierce-Arrow Motor Car Co. sales building, to Truscon Steel Co.

BELLEVILLE, N. J., 400 tons, isolation hospital for Essex County, to Igoe Brothers.

SOUTH BEND, IND., 130 tons, Michigan-Indiana office building, to Concrete Engineering Co.

STATE OF INDIANA, 100 tons, road work, to Concrete Engineering Co.

CHICAGO, 600 tons, apartment building on Sheridan Road, to Inland Steel Co.

CHICAGO, 120 tons, factory building, to Calumet Steel Co.

EVANSTON, ILL., 290 tons, telephone building, to an unnamed bidder.

CHICAGO, 550 tons, building for W. F. Hall Printing Co., to Joseph T. Ryerson & Son.

COLUMBIA, PA., 4000 tons, Columbia-Wrightsville, Pa., bridge, to Edward T. Edwards, Columbia, Pa.

MINNEAPOLIS, 600 tons, Washburn-Crosby grain elevator, to Sheffield Steel Corporation; previously reported to an unnamed bidder.

MCALESTER, OKLA., 175 tons, Masonic Temple, to Laclede Steel Co.

BURLEY, IDAHO, 100 tons, canal, to unnamed bidder.

OAKLAND, CAL., 157 tons, office building, Thirtieth and Summit Streets, to Gunn, Carle & Co.

HONOLULU, 500 tons, office, garage and warehouse for Dillingham Transport Co., to Pacific Coast Steel Co.

SACRAMENTO, CAL., 281 tons, paving in Sacramento County, to unnamed bidder.

SACRAMENTO, 180 tons, paving in Santa Clara County, to unnamed bidder.

LOS ANGELES, 210 tons, apartment building at 458 South Catalina Street, to Pacific Coast Steel Co.

SAN FRANCISCO, 100 tons, school at Geary and Cook Streets, to Pacific Coast Steel Co.

Reinforcing Bars Pending

Inquiries for reinforcing steel bars include the following:

SOMERSET HILLS, N. J., 600 tons, buildings for Veterans' Hospital; bids on general contract to be taken June 7.

COATESVILLE, PA., 700 tons, buildings for United States Veterans' Hospital.

CHICAGO, 120 tons, factory at 839 Sedgwick Avenue; A. Markus, contractor.

CHICAGO, 100 tons, West Town State Bank building.

SACRAMENTO, CAL., 416 tons, bridge over Cottonwood Creek; bids June 19.

SACRAMENTO, 156 tons, paving in San Diego County; bids June 19.

Boston office of Pilling & Co., pig iron, coke, etc., has been closed. F. F. Newcomb, Worcester, Mass., will continue as New England representative.

SIDE GUIDE & GRIPPER

Philadelphia

Shipbuilding Plates and Shapes Likely to Go to Eastern Pennsylvania Mills—Pig Iron Quiet

PHILADELPHIA, June 4.—Tonnage of steel moving from mills has been slightly smaller than earlier in the quarter, but operating rates continue high. Eastern Pennsylvania mills have substantial business in prospect from shipbuilders, possibly as much as 50,000 tons. A large part of the plate and shape requirements of the New York Shipbuilding Co. for ships under contract, but awaiting approval of the Shipping Board, is expected to go to two or three eastern Pennsylvania producers. Prices of all steel products are firm, but no advances are likely for third quarter business. The Pennsylvania Railroad has not yet inquired for its third quarter requirements, but the Chesapeake & Ohio Railroad is in the market for 3000 tons of plates, shapes and bars and the Western Maryland Railroad is also inquiring for a small tonnage for delivery in the next quarter.

Pig Iron.—Sellers of Birmingham pig iron in this district are widely offering foundry grades at $15 per ton, furnace, but no substantial tonnages are reported to have been sold. The smaller foundry consumers are not inclined to change their present mixtures unless there is a decided advantage in price, but on inquiries for sizable tonnages of iron severe competition is expected from Birmingham. The Sun Shipbuilding & Dry Dock Co., Chester, Pa., has closed on 250 tons of foundry iron. The Navy Yard at Norfolk, Va., is in the market for 100 tons of No. 1X and the Navy Department is inquiring for a carload of No. 2X foundry iron for Pearl Harbor, Hawaii. No basic iron has been bought, but one eastern Pennsylvania mill has evinced interest in a substantial tonnage at the former market price of $20 per ton, furnace, and has been pressing for heavy shipments on its current contracts.

Prices per gross ton at Philadelphia:

East. Pa. No. 2, 1.75 to 2.25 sil.	$21.76 to $22.26
East. Pa. No. 2X, 2.25 to 2.75 sil.	22.26 to 22.76
East. Pa. No. 1X	22.76 to 23.26
Basic (del'd east. Pa.)	20.25 to 21.00
Gray forge	20.50 to 21.00
Malleable	21.25 to 21.75
Stand. low phos. (f.o.b. N. Y. State furnace)	22.00 to 23.00
Cop. b'r'g low phos. (f.o.b. furnace)	23.50 to 24.00
Va. No. 2 plain, 1.75 to 2.25 sil.	24.04
Va. No. 2X, 2.25 to 2.75 sil.	24.54

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to $1.64 from eastern Pennsylvania furnaces; $4.54 from Virginia furnaces.

Bars.—Tonnages on mill books are still large from the railroads and automobile manufacturers. Third quarter requirements of the Chesapeake & Ohio Railroad include several hundred tons of bars. Prices are firm at 1.95c., Pittsburgh, or 2.27c. per lb., delivered Philadelphia.

Shapes.—New building contracts have been less numerous, but most fabricating shops are well engaged. Shape mills are moderately well booked, but quotations are still rather irregular, ranging from 1.90c. per lb., f.o.b. nearest mill to consumer, to 2c. and 2.05c., f.o.b. mill, depending upon the desirability of the order. Based on Pencoyd, Pa., the delivered prices Philadelphia are 1.96c. to 2.06c. per lb., base.

Reinforcing Bars.—No sizable projects requiring reinforcing bars have developed in Philadelphia since the new building code, permitting the full use of rail steel bars, became effective. At Coatesville, Pa., upward of 700 tons of reinforcing bars will be required in buildings for a United States Veterans' Hospital. Reinforcing bars in the Columbia-Wrightsville, Pa., bridge, about 4000 tons, have been awarded to E. T. Edwards of Columbia. Billet steel bar prices range from 1.90c. to 1.95c. per lb., Pittsburgh, quoted by eastern Pennsylvania mills, to 2c. and 2.05c., Pittsburgh, quoted by Pittsburgh makers. Delivered Philadelphia, billet steel bars are 2.22c. to 2.37c. per lb., with $5 extra for cutting to length. Rail steel bars are about 1.95c., Franklin, Pa., or Tonawanda, N. Y., or 2.27c., delivered Philadelphia, with no extra for cutting to length.

Plates.—Mills are maintaining a high rate of operation and have some sizable tonnages in prospect from shipbuilders. Plates are quoted at 2.05c., Coatesville, Pa., or 2.15c. per lb., delivered Philadelphia.

Sheets.—Radio manufacturers are active buyers and have placed substantial orders for deep drawing and electrical sheets covering requirements for the next month to six weeks. Automobile body builders are specifying against current contracts, but are less active than a month ago. Mills have not announced third quarter contract prices, but are apparently willing to book tonnage at the present quotations of 2.95c., Pittsburgh, or 3.27c., delivered Philadelphia, for black, 3.70c. Pittsburgh, or 4.02c., Philadelphia, for galvanized, and on the new blue annealed sheet bases of 2.35c. per lb., Pittsburgh, for No. 13 gage and 2.20c. per lb., base Pittsburgh, for No. 10 gage and heavier.

Warehouse Prices, f.o.b. Philadelphia

	Base per Lb.
Plates, ¼-in. and heavier	2.70c.
Plates, ⅜-in.	2.90c.
Structural shapes	2.70c.
Soft steel bars, small shapes, iron bars (except bands)	2.80c.
Round-edge iron	3.50c.
Round-edge steel, iron finished 1½ x 1½ in.	3.50c.
Round-edge steel, planished	4.30c.
Reinforc. steel bars, sq. twisted and deform.	2.60c. to 2.80c.
Cold-fin. steel, rounds and hex	3.60c.
Cold-fin. steel, sq. and flats	4.10c.
Steel hoops	3.40c.
Steel bands, No. 12 to ⅞-in. inclus.	3.15c.
Spring steel	5.00c.
*Black sheets (No. 24)	4.10c.
†Galvanized sheets (No. 24)	4.85c.
Blue ann'l'd sheets (No. 10)	3.25c.
Diam. pat. floor plates—	
¼-in.	5.30c.
⅜-in.	5.50c.
Rails	3.20c.
Swedish iron bars	6.60c.

*For 50 bundles or more; 10 to 49 bun., 4.10c. base; 1 to 9 bun., 4.35c. base.
†For 50 bundles or more; 10 to 49 bun., 4.95c. base; 1 to 9 bun., 5.30c. base.

Imports.—In the week ended June 1, 5565 tons of chrome ore arrived at this port, of which 3765 tons was from Cuba and 1800 tons from Greece. Pig iron imports consisted of 1293 tons from British India. There were no arrivals of steel.

Old Material.—In the absence of consumer buying, all grades of scrap are unchanged in price. A plentiful supply is being shipped on contracts. Prices still show a tendency toward weakness. At the present low price of No. 1 heavy melting steel, as compared with the cost of basic iron, consumers are reported to be increasing the use of No. 1 steel and decreasing the basic tonnage in their melt.

Prices per gross ton delivered consumers' yards, Philadelphia district:

No. 1 heavy melting steel	$16.00
Scrap T rails	15.50
No. 2 heavy melting steel	$12.50 to 13.50
No. 1 railroad wrought	16.00 to 16.50
Bundled sheets (for steel works)	11.50
Hydraulic compressed, new	14.00 to 15.00
Hydraulic compressed, old	11.50 to 12.00
Machine shop turnings (for steel works)	11.50
Heavy axle turnings (or equiv.)	14.00 to 14.50
Cast borings (for steel works and roll. mill)	11.00 to 11.50
Heavy breakable cast (for steel works)	15.50
Railroad grate bars	12.00 to 12.50
Stove plate (for steel works)	12.00 to 12.50
No. 1 low phos., hvy., 0.04% and under	22.00 to 23.00
Couplers and knuckles	20.00 to 21.00
Rolled steel wheels	20.00 to 21.00
No. 1 blast f'nace scrap	10.50 to 11.00
Wrot. iron and soft steel pipes and tubes (new specific.)	15.50
Shafting	19.00 to 19.50
Steel axles	23.00 to 23.50
No. 1 forge fire	14.00
Cast iron carwheels	16.00 to 16.50
No. 1 cast	16.50 to 17.00
Cast borings (for chem. plant)	15.00
Steel rails for rolling	16.50 to 17.00

Samuel G. Keywell Co., foot of Glover Street, Detroit, scrap dealer, has bought 3000 tons of wire which has been removed from the new Detroit-Windsor bridge. The wire had to be scrapped because of faulty shoes built to hold the wire in place. It will be removed in 30-ft. lengths and stored in the Keywell company's new yard at 11833 Vernor Highway, Detroit.

The American Railway Tool Foremen's Association will hold its annual convention at Hotel Sherman, Chicago, Sept. 11 to 13. Concurrently the Supply Association of the American Railway Tool Foremen's Association will hold an exhibition.

SIDE GUIDE & GRIPPER

Pacific Coast

California Tire Plant Takes 2500 Tons of Structural Steel—Reinforcing Bar Awards Heavy

SAN FRANCISCO, June 1 (*By Air Mail*).—Movement of steel products this week was confined mostly to structural steel shapes and reinforcing steel bars. Several fair-sized plate projects came up for figures, and bids were opened on some large cast iron pipe tonnages. The Consolidated Steel Corporation booked 2500 tons of shapes for a plant at South Gate, Cal., and the United States Cast Iron Pipe Co. was low bidder on 2400 tons of pipe for Long Beach, Cal.

Pig Iron.—While foundry operations have improved somewhat of late, demand for foundry iron continues to call for relatively small lots, due to the fact that most consumers have fair-sized stocks. Prices are unchanged.

Prices per gross ton at San Francisco:

*Utah basic	$25.00 to $26.00
*Utah fdy., sil. 2.75 to 3.25	25.00 to 26.00
**Indian fdy., sil. 2.75 to 3.25	25.00 to 26.00

*Delivered San Francisco.
**Duty paid, f.o.b. cars San Francisco.

Bars.—Awards of reinforcing steel bars this week were the heaviest in a month, exceeding 1800 tons. The Pacific Coast Steel Co. took 500 tons for buildings in Honolulu for the Dillingham Transport Co., 210 tons for an apartment house in Los Angeles and 100 tons for a school in San Francisco. Pending business includes 416 tons for a bridge in California and 156 tons for State highway work. Movement of merchant bar material is limited to unimportant lots. On this class of bars, 2.35c., c.i.f., is firm. Out-of-stock prices on reinforcing bars in San Francisco hold at 2.30c., base, on carload lots, at 2.20c. on lots of 250 tons, and at 2.60c. on less than carload lots. In the Los Angeles district prices are $2 a ton higher.

Plates.—Bids were opened this week on 500 tons for a penstock at Seattle for the Mount Diablo power project and on 230 tons for a pipe line at Walla Walla, Wash. No new inquiries of importance came up for figures. The Western Pipe & Steel Co. took 195 tons for a 24-in. electrically welded steel pipe line for Los Angeles and 175 tons for an 82,000 bbl. tank in Seattle for the Shell Oil Co. Prices continue fairly firm at 2.35c., c.i.f.

Warehouse Prices, f.o.b. San Francisco

	Base per Lb.
Plates and struc. shapes	3.15c.
Soft steel bars	3.15c.
Small angles, ⅞-in. and over	3.15c.
Small angles, under ⅞-in.	3.55c.
Small channels and tees, ¾-in. to 2¾-in.	3.75c.
Spring steel, ¼-in. and thicker	5.00c.
Black sheets (No. 24)	4.90c.
Blue ann'l'd sheets (No. 10)	3.80c.
Galv. sheets (No. 24)	5.30c.
Struct. rivets, ½-in. and larger	5.65c.
Com. wire nails, base per keg	$3.40
Cement c't'd nails, 100 lb. keg	3.40

Structural Steel.—Besides the 2500 tons booked by the Consolidated Steel Corporation for the Firestone Tire & Rubber Co.'s new plant at South Gate, Cal., one other good-sized job was closed in the past week. This was 1500 tons for a flotation plant for the New Cornelia Mining Co. at Ajo, Ariz., which was awarded to the Kansas City Structural Steel Co. New inquiries include 600 tons for an overhead crossing at Barstow, Cal., and 135 tons for a bridge repair project at Wenatchee, Wash. Plain material is firm at 2.35c., c.i.f.

Cast Iron Pipe.—Demand for cast iron pipe has improved slightly and awards included 338 tons of 4 to 12-in. Class B pipe for South Gate, Cal., placed with Edgley Co., Los Angeles; 273 tons of 4 to 12-in. Class B for Santa Barbara, Cal., booked by the National Cast Iron Pipe Co., and 188 tons of 4 to 10-in Class C for the improvement of Mountain View Drive, San Diego, Cal., placed with Daley Corporation. Bids were opened on 2398 tons of 6-in. Class B for Long Beach, Cal., on which the United States Cast Iron Pipe Co. was low bidder. Bids were also opened on 963 to 1283 tons of 20 or 24-in. Class B pipe for Walla Walla, Wash., alternate bids having been taken on riveted steel pipe. Silver City, New Mex., opened bids on 1123 tons of 6 and 8-in. Class B pipe. No new inquiries of importance developed.

Birmingham

Steel Sales and Inquiries Hold at May's High Rate—Pig Iron Demand Light

BIRMINGHAM, June 4.—All pig iron sales are for delivery during June. Melters have shown only a slight interest in the third quarter. Buying has been close throughout the present quarter and the carryover will be light. Iron is being quoted at $15 for sales outside the district, but merchant producers state there has been no waiving of silicon differentials, as reported from other points. District sales are at $15.50. The new rail rates to seaboard points, to become effective June 13, will be $3.50 to Norfolk, $2.70 to Savannah and $2.45 to Mobile. The proposed through rail and barge rates will become effective on July 4 or 5. They will be $5 to Baltimore, $5.25 to Philadelphia, $5.50 to New York and $5.75 to Boston. The reduction will range from 76c. a ton to Baltimore to $1.16 a ton to Boston. The Alabama City furnace of the Gulf States Steel Co. was changed from basic to foundry iron on June 1. Eleven furnaces are now on foundry iron, five on basic and one on recarburizing iron, a total of 17.

Prices per gross ton, f.o.b. Birmingham dist. furnaces:

No. 2 fdy., 1.75 to 2.25 sil.	$15.00 to $15.50
No. 1 fdy., 2.25 to 2.75 sil.	15.50 to 16.00
Basic	15.00 to 15.50

Finished Steel.—Sales and inquiries are keeping pace with those of May, which was the outstanding month of the past several years. New business continues to average a little better than shipments. Mills are not promising deliveries under five or six weeks in several lines. Prices are unchanged. The Reeves Brothers Co. booked an order for 4000 tons of tank work for the Shell Petroleum Corporation, Houston, Tex. Structural steel fabricators are working off some of the heavy tonnage on their books. The Ingalls Iron Works booked an order for 125 tons for the S. H. Kress Co. at Lakeland, Fla. Reinforcing bar manufacturers report a good improvement in small orders, but sizable tonnages have been few. The Gulf States Steel Co. is now operating six open hearths, an increase of one, and the total in operation in the district is now 21.

Cast Iron Pipe.—New business last week fell short of that of the previous week, but there was a noticeable increase in inquiries, especially for small lots. Plants are busy on contracts to be completed during June and early July. The American Cast Iron Pipe Co. has booked 150 tons for Detroit and 115 tons for Waco, Tex. About 10,000 tons is up for figures, including 6500 tons of 36 to 48-in. pipe to be let by New Orleans on June 26. Hollywood, Fla., will award 700 tons on June 11. Bids have been opened and award is pending on 12,000 ft. of 6-in. for Memphis, Tenn. Pressure pipe manufacturers report a noticeable improvement in shipments in the past 10 days. Prices are steady at $37 to $38.

Coke.—Foundry coke consumers are beginning to renew contracts for the third quarter and second half. Quotations for the second half are $5, the price that has prevailed through the present half.

Old Material.—Business is quiet and prices are weak. Steel grades are moving a little. No. 1 cast is weaker.

Prices per gross ton, deliv'd Birmingham dist. consumers' yards:

Heavy melting steel	$12.50
Scrap steel rails	13.00
Short shoveling turnings	9.00
Cast iron borings	9.00
Stove plate	13.00
Steel axles	21.00
Iron axles	23.00
No. 1 railroad wrought	$10.00 to 10.50
Rails for rolling	14.00 to 15.00
No. 1 cast	14.00
Tramcar wheels	13.00 to 14.00
Cast iron carwheels	13.00 to 13.50
Cast iron borings, chem.	13.50 to 14.00

Buffalo

Steel Mills Still Operating at a Full Rate—Pig Iron Buying Is Quiet—Scrap Dull

BUFFALO, June 4.—Pig iron business has been very quiet over the past week. A Titusville, Pa., melter is inquiring for 500 tons of No. 2 plain and 500 tons of No. 3. Prices in the district are holding firm at $19.50. On some of the 200 and 300-ton lots that have been going to the East, Buffalo producers have obtained $18.50, base. On small lots of malleable sold in the district, $20 has been obtained. There are no large stocks of iron here. Some storage iron is moving by barge to Eastern points, but most of this canal iron is against direct orders.

Prices per gross ton, f.o.b. furnace:

No. 2 fdy., sil. 1.75 to 2.25	$18.50 to $19.50
No. 2X fdy., sil. 2.25 to 2.75	19.00 to 20.00
No. 1 fdy., sil. 2.75 to 3.25	20.00 to 21.00
Malleable, sil. up to 3.25	19.00 to 20.00
Basic	17.50 to 18.50
Lake Superior charcoal	27.28

Finished Iron and Steel.—Operation of all finishing mills is still at close to capacity. The Lackawanna plant of the Bethlehem Steel Co. continues to operate 22 of its 24 open-hearths, and is running all the mills on double time. The Donner Steel Co. is operating nine open-hearths, and broke its record for production in May. The Seneca Iron & Steel Co. and the Wickwire-Spencer Corporation continue to operate at a high rate. The demand for bars, shapes and plates is good. A number of small jobs have been taken by structural steel fabricators, but nothing of large size is in the offing except 7000 to 8000 tons which will be needed for the new city hall. Reinforcing bars are active.

Old Material.—While consumption is heavy, melters are apparently content to wait before coming into the market. Last week did not bring any purchasing of consequence. One small tonnage of heavy melting steel was closed at $17.25. There are some unfilled orders at $17.75 to $18, and dealers are paying $17.25 against this commitment. Foundries show a slight slackening, and this is affecting the No. 1 machinery cast and the specialty grades. Malleable is just holding its own, with a few sales at $19.50 to $19.75. Cast iron borings are weaker.

Warehouse Prices, f.o.b. Buffalo

	Base per Lb.
Plates and struc. shapes	3.40c.
Soft steel bars	3.30c.
Reinforcing bars	2.95c.
Cold-fin. flats, sq. and hex.	4.45c.
Rounds	3.95c.
Cold-rolled strip steel	5.85c.
Black sheets (No. 24)	4.20c.
Galv. sheets (No. 24)	4.85c.
Blue ann'l'd sheets (No. 10)	3.50c.
Com. wire nails, base per keg	$3.60
Black wire, base per 100 lb.	3.75

Prices per gross ton, f.o.b. Buffalo consumers' plants:

Basic Open-Hearth Grades	
No. 1 heavy melting steel	$17.00 to $17.25
No. 2 heavy melting steel	14.75 to 15.00
Scrap rails	17.00 to 18.00
Hydraul. comp. sheets	14.50 to 14.75
Hand bundled sheets	12.00 to 12.50
Drop forge flashings	14.75 to 15.00
No. 1 busheling	15.50 to 16.50
Hvy. steel axle turnings	14.00 to 14.50
Machine shop turnings	7.50 to 7.75
No. 1 railroad wrought	13.50 to 14.00
Acid Open-Hearth	
Knuckles and couplers	19.50 to 20.00
Coil and leaf springs	19.50 to 20.00
Rolled steel wheels	19.50 to 20.00
Low phos. billet and bloom ends	20.00 to 20.50
Electric Furnace Grades	
Short shov. steel turnings	12.00 to 12.50
Blast Furnace Grades	
Short mixed borings and turnings	10.50 to 11.50
Cast iron borings	10.50 to 11.00
No. 2 busheling	10.00 to 10.50
Rolling Mill Grades	
Steel car axles	18.75 to 19.25
Iron axles	21.00 to 22.00
Cupola Grades	
No. 1 machinery cast	16.00 to 17.00
Stove plate	12.50 to 13.00
Locomotive grate bars	12.50 to 13.00
Steel rails, 3 ft. and under	19.50 to 20.00
Cast iron carwheels	14.00 to 14.50
Malleable Grades	
Industrial	19.00 to 20.00
Railroad	19.00 to 20.00
Agricultural	19.00 to 20.00
Special Grades	
Chemical borings	12.50 to 13.50

ite City Steel Co. has established two basing gages on blue annealed, as announced some time ago by other manufacturers. The Granite City plant continues to operate at a satisfactory rate, and its schedule for this week calls for the full operation of all mills. Incoming specifications are reported to be in heavy volume, resulting in an increasing backlog and extended deliveries. The demand for tin plate has improved considerably. Virtually all lines of building operations are at a standstill because of strikes. The only award of the week was 170 tons of reinforcing bars for a Masonic Temple at McAlester, Okla., to the Laclede Steel Co.

Old Material.—The market is fairly active, with most items unchanged in price. Some consumers are willing to buy at present levels, while others are seeking to place orders at lower prices. Dealers are conservative in taking on business. Bundled sheets, machine shop turnings, No. 1 railroad wrought and railroad malleable are off 50c. a ton. Railroad lists follow: Baltimore & Ohio, 14,535 tons; Cleveland, Cincinnati, Chicago & St. Louis, 1100 tons; Missouri Pacific, 148 carloads; Chicago, Milwaukee, St. Paul & Pacific, 76 carloads; Frisco, eight carloads; New Orleans & Great Northern, 105 tons.

Dealers' buying prices per gross ton, f.o.b. St. Louis district:

No. 1 heavy melting or shoveling steel	$13.25 to $13.75
No. 2 heavy melting or shoveling steel	12.75 to 13.25
No. 1 locomotive tires	15.00 to 15.50
Miscel. stand.-sec. rails including frogs, switches and guards, cut apart	15.00 to 15.50
Railroad springs	17.00 to 17.50
Bundled sheets	9.50 to 10.00
No. 2 railroad wrought	13.25 to 13.75
No. 1 busheling	10.00 to 10.50
Cast iron borings and shoveling turnings	9.50 to 10.00
Iron rails	15.00 to 15.50
Rails for rolling	15.50 to 16.00
Machine shop turnings	7.50 to 8.00
Heavy turnings	10.00 to 10.50
Steel car axles	18.75 to 19.25
Iron car axles	26.50 to 27.00
Wrot. iron bars and trans.	22.00 to 22.50
No. 1 railroad wrought	13.00 to 13.50
Steel rails, less than 3 ft.	16.50 to 17.00
Steel angle bars	14.25 to 14.75
Cast iron carwheels	14.25 to 14.75
No. 1 machinery cast	15.50 to 16.00
Railroad malleable	15.25 to 15.75
No. 1 railroad cast	15.00 to 15.50
Stove plate	12.75 to 13.25
Agricult. malleable	15.00 to 15.50
Relay. rails, 60 lb. and under	20.50 to 23.50
Relay. rails, 70 lb. and over	26.50 to 29.00

Warehouse Prices, f.o.b. St. Louis

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.15c.
Cold-fin. rounds, shafting, screw stock	3.75c.
Black sheets (No. 24)	4.25c.
Galv. sheets (No. 24)	5.10c.
Blue ann'l'd sheets (No. 10)	3.45c.
Black corrug. sheets (No. 24)	4.30c.
Galv. corrug. sheets	5.15c.
Structural rivets	3.95c.
Boiler rivets	3.95c.
	Per Cent Off List
Tank rivets, 7/8-in. and smaller, 100 lb. or more	65
Less than 100 lb.	60
Machine bolts	60
Carriage bolts	60
Lag screws	60
Hot-pressed nuts, sq., blank or tapped, 200 lb. or more	60
Less than 200 lb.	50
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more	60
Less than 200 lb.	50

St. Louis

Pig Iron Shipments Heavy—Steel Plant Operations at High Rate—Some Price Declines on Scrap

ST. LOUIS, June 3.—Shipments of pig iron by the St. Louis Gas & Coke Corporation during May totaled 37,000 tons, or 6000 tons in excess of the company's make, and within 3000 of the record month for the company's shipments attained last October. Melters continue to urge shipments against contracts, and the melt in the district is being well maintained. Stove manufacturers report advance orders somewhat larger than at this time last year. Buying is extremely light, as melters generally are covered on their requirements for second quarter, and are withholding buying for third quarter. Sales of the local maker for the week totaled only 1700 tons, all for third quarter except 550 tons. The larger orders included 200 and 300 tons to Iowa melters and 500 tons to an Illinois concern, all third quarter. Prices are unchanged.

Prices per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill.	$20.00
Malleable, f.o.b. Granite City	20.50
N'th'n No. 2 fdy., deliv'd St. Louis	22.16
Southern No. 2 fdy., deliv'd	$19.42 to 19.92
Northern malleable, deliv'd	22.16
Northern basic, deliv'd	22.16

Freight rates: 75c. (average) Granite City to St. Louis; $2.16 from Chicago; $4.42 from Birmingham.

Coke.—Buying of domestic grades of coke has been better than expected and earlier than usual.

Finished Iron and Steel.—The Gran-

SIDE GUIDE & GRIPPER

Cincinnati

Pig Iron Buying for Third Quarter Increases but Prices Are Weak—Sheet Demand Falls Off Slightly

CINCINNATI, June 4.—Third quarter pig iron buying showed substantial improvement the past week, with total sales estimated at 15,000 tons. Included in the bookings were 1000 tons of foundry iron for a Springfield, Ohio, company, and 500 tons for a Cincinnati melter. Inquiries, however, continue to lag, and the only important pending transaction consists of 1000 tons of foundry and charcoal iron for the Louisville & Nashville Railroad. Prices of both Northern and Southern iron are tending toward weakness. Southern furnaces are quoting $15, Birmingham, with silicon differentials waived, while Northern iron is sagging somewhat under the pressure of severe competition in western Ohio and in eastern Indiana. Northern Ohio producers are reported to be offering foundry iron at $18, furnace, to southern Ohio consumers. The Globe Iron Co., Jackson, Ohio, will blow in its new blast furnace for the production of silvery iron this week.

Prices per gross ton, deliv'd Cincinnati:

So. Ohio fdy., sil. 1.75 to 2.25	$19.89 to $20.39
Ala. fdy., sil. 1.75 to 2.25	18.69 to 19.19
Ala. fdy., sil. 2.25 to 2.75	19.19
Tenn. fdy., sil. 1.75 to 2.25	19.19
S'th'n Ohio silvery, 8 per cent	27.89 to 28.89

Freight rates, $1.89 from Ironton and Jackson, Ohio; $3.69 from Birmingham.

Finished Material.—Despite the fact that specifications and orders from automobile makers have fallen off in the past few weeks, sheet steel producers declare that bookings are sustained at a high level by a steady demand from other consuming lines. Sales in May were of liberal proportions, but did not equal those in any of the three previous months. Consequently, the volume of unfilled orders has declined, but is still large enough to keep operations at full capacity the remainder of this month. Bars, shapes and plates are moving at a fair rate. Orders for wire goods continue brisk, with common wire nails selling at $2.69 per keg, delivered Cincinnati.

Coke.—By-product foundry coke specifications turned upward the past week, but local dealers are anticipating a considerable decline in shipments before the end of the month, largely on account of decreased demand from automobile foundries. The Louisville & Nashville is in the market for 585 tons of 72-hr. beehive or by-product foundry coke for third quarter delivery. Prices are firm and unchanged.

Old Material.—The scrap market is characterized by steadiness, which is reflected in stability of prices. With the exception of a drop of 25c. a ton on sheet clips, quotations are the same as a week ago. Although buying by consumers has been exceptionally light, dealers are having difficulty in securing material to cover short orders.

Dealers' buying prices per gross ton, f.o.b. cars, Cincinnati:

Heavy melting steel	$13.00 to $13.50
Scrap rails for melting	13.75 to 14.25
Loose sheet clippings	9.25 to 9.75
Bundled sheets	10.50 to 11.00
Cast iron borings	9.00 to 9.25
Machine shop turnings	8.50 to 8.75
No. 1 busheling	10.50 to 11.00
No. 2 busheling	6.75 to 7.00
Rails for rolling	14.50 to 15.00
No. 1 locomotive tires	14.25 to 14.75
No. 2 railroad wrought	13.00 to 13.50
Short rails	18.50 to 19.00
Cast iron carwheels	12.75 to 13.25
No. 1 machinery cast	19.25 to 19.75
No. 1 railroad cast	15.25 to 15.75
Burnt cast	10.25 to 10.75
Stove plate	10.25 to 10.75
Brake shoes	10.25 to 10.75
Railroad malleable	15.25 to 15.75
Agricultural malleable	14.25 to 14.75

Warehouse Prices, f.o.b. Cincinnati

	Base per Lb.
Plates and struc. shapes	3.40c.
Bars, soft steel or iron	3.30c.
New billet reinforc. bars	3.15c.
Rail steel reinforc. bars	3.00c.
Hoops	4.05c.
Bands	3.50c.
Cold-fin. rounds and hex.	3.85c.
Squares	4.35c.
Black sheets (No. 24)	4.05c.
Galvanized sheets (No. 24)	4.90c.
Blue ann'l'd sheets (No. 10)	3.45c.
Structural rivets	3.85c.
Small rivets	65 per cent off list
No. 9 ann'l'd wire, per 100 lb.	$3.00
Com. wire nails, base per keg	2.95
Cement c't'd nails, base 100 lb. keg	2.95
Chain, per 100 lb.	8.75
	Net per 100 Ft.
Lap-weld steel boiler tubes, 2-in.	$16.00
4-in.	33.00
Seamless steel boiler tubes, 2-in.	17.00
4-in.	34.00

Detroit

June Automobile Output Probably Will Drop Below the High Record of May

DETROIT, June 4.—It is not expected that June output of automobiles will equal that of May, considering the fact that an average of slightly more than one month's supply of new cars is now in the hands of distributers.

May automobile production figures are not yet complete, but probably will show a recession, as compared with the peak of April.

Chevrolet in May built 3158 more units than in April and probably will operate through June at an equal rate. This company reports that its unfilled orders are 300 per cent larger than on June 1, one year ago.

Ford Motor Co.'s output in May totaled 175,207 cars and trucks, while the combined domestic, Ford of Canada and export production was 200,903 units.

Chrysler Corporation in May shipped 54,595 cars and trucks, an increase of 14,991 over May, 1928. Shipments for the first five months totaled 237,134 units, a gain of 37,663 over the combined shipments of Chrysler and Dodge during the first five months of 1928.

Hudson and Essex output in May was 42,086, compared with 32,450 in May, 1928. In the five months ended June 1, 194,570 Hudson and Essex cars were shipped, as compared with 151,887 for the corresponding period of 1928.

Packard shipped 4561 cars in May, as compared with 3706 in May, last year. Packard production for five months totaled 23,398, against 22,214 for the same period of last year.

Nash Motors Co. shipped 12,117 cars in May, against 16,066 in April and 1342 in May, 1928, when the plants were closed down prior to the introduction of new models.

Graham-Paige set a new production record in May with a total of 11,677 cars. Its previous high record was in April, when 11,550 cars were turned out. For the first five months of 1929 Graham-Paige was 62 per cent ahead of the same period last year.

The Marmon Motor Co. shipped 5221 cars in May; the Oakland division of General Motors shipped 28,444 units; the Auburn Automobile Co. shipped 3032 cars, a new high monthly record, and the Peerless Motor Car Co. shipped 807, as compared with 1778 in April.

There have been some changes in prices on old material in the district. Long turnings and hydraulic compressed sheets have declined 25c. a ton and sheet clippings have dropped 50c. While there is a possible 5 to 10 per cent reduction in automotive production schedules, the amount of scrap offered for the month is about the same as for May.

Dealers' buying prices per gross ton, f.o.b. cars, Detroit:

Hvy. melting and shov. steel	$14.00 to $14.50
Borings and short turnings	9.00 to 9.50
Long turnings	7.00 to 7.50
No. 1 machinery cast	13.00 to 13.50
Automobile cast	13.00 to 13.50
Hydraul. comp. sheets	13.75 to 14.25
Stove plate	9.50 to 10.00
New No. 1 busheling	12.00 to 12.50
Old No. 1 busheling	11.00 to 11.50
Sheet clippings	8.50 to 9.00
Flashings	12.00 to 12.50

Mystic Iron Works, Everett, Mass., has closed a contest for a name for its new product—malleable pig iron—and has selected Nekonegan, which was suggested by Harry W. Chapman, president, T. M. Chapman's Sons Co., Old Town, Me. Nekonegan is a Penobscot Indian name. Foundrymen took a lively interest in the contest, a flood of suggestions from many parts of the country and Canada having been received.

Illinois Pipe Line Co. is considering laying a 6-in. oil line from Dupo to Woodriver, Ill., a distance of about 35 miles.

Boston

Pig Iron Market Quiet—Week's Sales About 5500 Tons—More Interest Shown in Scrap

BOSTON, June 4.—Pig iron sales the past week included 2000 tons of No. 1X to a textile machinery maker. The week's total did not exceed 5500 tons. No. 2X Buffalo iron generally can be bought at $18.50 and No. 2 plain at $18.

Foundry iron prices per gross ton deliv'd to most New England points:

*Buffalo, sil. 1.75 to 2.25	$22.91 to $23.41
*Buffalo, sil. 2.25 to 2.75	23.41 to 23.91
East. Penn., sil. 1.75 to 2.25	25.15
East. Penn., sil. 2.25 to 2.75	25.65
Va., sil. 1.75 to 2.25	25.21
Va., sil. 2.25 to 2.75	25.71
Ala., sil. 1.75 to 2.25	21.91 to 24.27
Ala., sil. 2.25 to 2.75	22.41 to 24.77

Freight rates: $4.91 all rail from Buffalo; $3.65 from eastern Pennsylvania; $5.21 all rail from Virginia; $6.91 to $8.77 from Alabama.

*All rail rate.

Reinforcing Bars.—About 700 tons of rail steel bars was sold the past week for road work in Vermont and Massachusetts. Local mill representatives continue to quote such bars at 2.26½c. per lb., base, delivered common Boston freight rate points, but the tonnage involved is reported to have sold at concessions of $2 to $3 a ton. Activity in billet steel reinforcing bars for the most part is confined to lots of 50 tons and less at 2.66½c. per lb., base, from stock.

Old Material.—Pennsylvania steel mills show more interest in scrap, but at prices which so far have failed to bring out much material. A fair tonnage of machine shop turnings has been moved at $6.50 a ton, on cars shipping point, and $6.60 also has been done, while brokers have bought tonnages of heavy melting steel at $11.50 to $11.75, mostly at $11.75; forge scrap at $9; forge flashings at $10; and blast furnace borings and turnings at $6.

Buying prices per gross ton, f.o.b. Boston rate shipping points:

No. 1 heavy melting steel	$11.50 to $11.75
Scrap T rails	11.00 to 11.25
Scrap girder rails	10.00 to 10.50
No. 1 railroad wrought	12.00 to 12.50
No. 1 yard wrought	9.50 to 10.00
Machine shop turnings	6.50 to 6.60
Cast iron borings (steel works and rolling mill)	6.50
Bundled skeleton, long	8.50 to 10.00
Forged flashings	10.00 to 10.50
Blast furnace borings and turnings	6.00 to 6.25
Forge scrap	8.75 to 9.00
Shafting	14.00 to 14.25
Steel car axles	16.50 to 17.00
Wrought pipe 1 in. in. diameter (over 2 ft. long)	10.50 to 10.75
Rails for rolling	12.00 to 12.50
Cast iron borings, chemical	10.00 to 10.25

Prices per gross ton deliv'd consumers' yards:

Textile cast	$14.50 to $14.75
No. 1 machinery cast	16.00 to 16.50
No. 2 machinery cast	14.00 to 14.50
Stove plate	11.50 to 12.00
Railroad malleable	19.00 to 19.50

Warehouse Prices, f.o.b. Boston

	Base per Lb.
Plates	3.365c.
Structural shapes—	
Angles and beams	3.365c.
Tees	3.365c.
Zees	3.465c.
Soft steel bars, small shapes	3.265c.
Flats, hot-rolled	4.15c.
Reinforcing bars	3.265c. to 3.54c.
Iron bars—	
Refined	3.265c.
Best refined	4.60c.
Norway rounds	6.60c.
Norway squares and flats	7.10c.
Spring steel—	
Open-hearth	5.00c. to 10.00c.
Crucible	12.00c.
Tie steel	4.50c. to 4.75c.
Bands	4.015c. to 5.00c.
Hoop steel	5.50c. to 6.00c.
Cold-rolled steel—	
Rounds and hex	*3.55c. to 5.55c.
Spares and flats	*4.05c. to 7.05c.
Toe calk steel	6.00c.
Rivets, structural or boiler	4.50c.

	Per Cent Off List
Machine bolts	50 and 5
Carriage bolts	50 and 5
Lag screws	50 and 5
Hot-pressed nuts	50 and 5
Cold-punched nuts	50 and 5
Stove bolts	70 and 10

*Including quantity differentials.

Canada

Structural Contracts Large —Pig Iron Weakens

TORONTO, ONT., June 4.—Steel mills are experiencing their best year since the war. Rail mills are being operated at capacity, merchant mills are running full time and almost all departments are operating on the largest scale in 10 years.

Pig Iron.—Business in this market, while somewhat dull compared with that of a couple of months ago, continues steady in small tonnage demand. Producers are expected to open their books within the next few days for third quarter contracts. Some melters have unfilled second quarter contracts that they desire extended into the third quarter, but the carryover tonnages are unusually small. Prices have recently shown a softening tendency in the Toronto market, with the result that all quotations on Toronto iron are now $24.10, producers having dropped the high level of $24.60. Montreal prices are firm, but unchanged.

Prices per gross ton:

Delivered Toronto	
No. 1 fdy., sil. 2.25 to 2.75	$24.10 to $24.60
No. 2 fdy., sil. 1.75 to 2.25	24.10 to 24.60
Malleable	24.10 to 24.60
Delivered Montreal	
No. 1 fdy., sil. 2.25 to 2.75	$25.50 to $26.00
No. 2 fdy., sil. 1.75 to 2.25	25.50 to 26.00
Malleable	25.50 to 26.00
Basic	24.50 to 25.00
Imported Iron, Montreal Warehouse	
Summerlee	$33.50
Carron	33.00

Structural Steel.—Several sales during the week ran into large tonnage, while those from 100 to 500 tons were fairly numerous. All fabricating plants in the dominion are running at capacity and have large unfilled orders. The Dominion Bridge Co. closed contracts for upward of 25,000 tons. These included 3000 tons for Lachapelle bridge at Montreal; 800 tons for a new power plant at Saskatoon, Sask.; 4000 tons for Marine Building at Vancouver, B. C., for the Stimsons Canadian Development Co. The Canadian Bridge Co., Walkerville, and the Hamilton Bridge Co., Hamilton, Ont., have also secured substantial structural steel orders within the past two or three weeks.

Old Material.—Business remains somewhat dull. Old material prices are firm, but unchanged.

Dealers' buying prices:

	Toronto	Montreal
	Per Gross Ton	
Heavy melting steel	$10.00	$8.50
Rails, scrap	11.00	9.00
No. 1 wrought	10.00	12.00
Machine shop turnings	7.50	5.00
Boiler plate	7.50	6.00
Heavy axle turnings	8.00	7.50
Cast borings	7.50	5.00
Steel turnings	7.50	6.50
Wrought pipe	6.00	6.00
Steel axles	15.00	20.00
Axles, wrought iron	17.00	22.00
No. 1 machinery cast	....	17.00
Stove plate	....	13.00
Standard carwheels	....	16.00
Malleable	....	13.00
	Per Net Ton	
No. 1 mach'ry cast	$16.00	....
Stove plate	12.00	....
Standard carwheels	15.00	....
Malleable scrap	14.00	....

British Alloy and Tool Steel Company Reorganizes

Darwins Ltd., Sheffield, England, a merger of several Sheffield steel concerns, and the pioneer in modern high-percentage chromium steels, and producer of patented cobalt-chromium steel and of the Darwin safety razor blades from the same material, was reorganized recently with a capital of £730,000, of which £530,000 were issued and fully subscribed.

Directors of the new company, which proposes to enter on a much larger manufacturing and selling program, extending outside of alloy tool steels and safety razor blades to kindred products, are the following: Sir James C. Calder (former timber controller during the war), Walter D. Morgan (managing director, Royal Typewriter Co. of America), G. C. Hamilton (chairman of Close Brothers, London), R. L. Shaw (E. H. Rollins & Sons, Boston and London), Joseph Ramsden, C. E. Siddall, and P. R. Kuehnrich, formerly the sole owner of the parent concerns and inventor of patented steels, the last named having been engaged for seven years as general manager and consultant for life.

The American Division of Darwins Ltd. is represented by Darwin & Milner, Inc., 1260 West Fourth Street, Cleveland, Victor F. J. Tlach, president.

Navy Department has awarded a contract to the Crucible Steel Co. of America for 57,600 5-in. shells, to be made at the plant of the company at Harrison, N. J.

Fabricated Structural Steel

New Projects of 50,000 Tons Include More Than 20,000 Tons For New Steel Mill—Awards Total 36,500 Tons

NEW business totaling about 50,000 tons was smaller than in the previous week, when the tonnage of new projects was unusually large. Outstanding among new inquiries is 20,000 to 30,000 tons in a new steel plant for the Great Lakes Steel Corporation, Ecorse, Mich. Another large inquiry is 7000 to 8000 tons for a city hall in Buffalo. In New York, the second section of the West Side traffic highway requiring about 22,000 tons is expected to be offered for bids next week. Awards of about 36,500 tons include 4000 tons for a building in Vancouver, B. C., 2800 tons for an International Harvester Co. building at Moline, Ill., and 3000 tons for a bridge at Montreal.

BANGOR, ME., 200 tons for Maine Central Railroad, to unnamed fabricator.

WATERVILLE, ME., 100 tons, church, to Maguire & Jones, Portland.

WALTHAM, MASS., 100 tons, stores, to New England Structural Co.

CAMBRIDGE, MASS., 600 tons, Harvard Stadium extension, to New England Structural Co.

STATE OF VERMONT, 500 tons, highway bridge, to American Bridge Co.

MONTREAL, 3000 tons, Lachapelle bridge, to Dominion Bridge Co.

NEW YORK, 400 tons, building for Baptist Home for the Aged, to Hedden Iron Construction Co.

NEW YORK, 600 tons, building at 192nd Street for Sheffield Farms Co., to National Bridge Co.

NEW YORK, 1100 tons, warehouse, Eleventh Avenue, Sixty-fifth to Sixty-sixth Streets, for New York Central Railroad, to McClintic-Marshall Co.

NEW YORK, 2600 tons, loft building at 1 Cedar Street, to Hedden Iron Construction Co.

NEW YORK, 1200 tons, public school No. 10 in Brooklyn, 900 tons, and public school No. 11 in Bronx, 300 tons, to Hedden Iron Construction Co.

NEW YORK, 600 tons, hotel at 13 Waverly Place, to Easton Structural Steel Co.

NEW YORK, 200 tons, garage at 542 West Twenty-sixth Street, to McClintic-Marshall Co.

NEW YORK, 400 tons, garage at 210 West Seventy-seventh Street, to A. E. Norton Co.

BROOKLYN, 150 tons, building on Atlantic Avenue for Pierce-Arrow Motor Co., to George A. Just Co.

LONG ISLAND CITY, N. Y., 525 tons, Long Island Casket Co., to Guibert Steel Co.

JERSEY CITY, 1800 tons, Jersey City Hospital, to Lehigh Structural Steel Co.

JERSEY CITY, 300 tons, parochial school, to Lehigh Structural Steel Co.

BAYWAY, N. J., 115 tons, rod mill floor frame for National Electric Products Corporation, to Jones & Laughlin Steel Corporation.

PENNSYLVANIA RAILROAD, 1300 tons, signal bridges at Bristol, Pa., to McClintic-Marshall Co.

READING, PA., 250 tons, building for Parrish Mfg. Co., to Belmont Iron Works.

SALTVILLE, VA., 300 tons, manufacturing plant, Stone & Webster, Inc., engineer, to Converse Bridge Co.

LAKELAND, FLA., 125 tons, S. H. Kress Co. store, to Ingalls Iron Works.

CHICAGO, 6500 tons, Patterson Estate Building, to American Bridge Co.

CHICAGO, 300 tons, Morton Salt Co., to Mississippi Valley Structural Steel Co.

CHICAGO, 1200 tons, apartment building on Lake Shore Drive, to American Bridge Co.

MOLINE, ILL., 2800 tons, International Harvester Co., to McClintic-Marshall Co.

SASKATOON, SASK., 800 tons, power plant, to Dominion Bridge Co.

AJO, ARIZ., 1500 tons, flotation plant for New Cornelia Mining Co., to Kansas City Structural Steel Co.

LOS ANGELES, 2500 tons, addition to Firestone Tire & Rubber Co. plant, to Consolidated Steel Corporation.

LOS ANGELES, 195 tons plates, 24-in. welded steel pipe, to Western Pipe & Steel Co.

SEATTLE, 175 tons, one 82,000-bbl. tank for Shell Oil Co., to Western Pipe & Steel Co.

VANCOUVER, B. C., 4000 tons, Marine Building, to Dominion Bridge Co.

Structural Projects Pending

Inquiries for fabricated steel work include the following:

WELLESLEY, MASS., 190 tons, Wellesley College administration building.

SOUTH DARTMOUTH, MASS., 150 tons, hangar.

NORTHAMPTON, MASS., 100 tons, Smith College dormitories.

STATE OF VERMONT, 300 tons, highway bridge.

NEW YORK, 4000 tons, building on Broad Street for International Telephone & Telegraph Co.

STATE OF NEW JERSEY, 5400 tons, bridge over Hackensack River at Kearny.

STATE COLLEGE, PA., 1000 tons, building for Pennsylvania State College.

PHILADELPHIA, 750 tons, bank and office building for Bank of Philadelphia and Trust Co.; bids in.

STATE OF PENNSYLVANIA, 300 tons, two highway bridges in Chester County, general contract to Smith, Fenstermacher & Co.

BARBERTON, OHIO, 200 tons, exchange building for Ohio Bell Telephone Co.

AKRON, 750 tons, Medical Arts Building.

CLEVELAND, 150 tons, Shaker Square power building.

BALTIMORE, 2000 tons, plant for Procter & Gamble Co.; bids June 3.

BUFFALO, 7000 to 8000 tons, City Hall.

ECORSE, MICH., 20,000 to 30,000 tons, plant for Great Lakes Steel Corporation.

SOUTH CHICAGO, ILL., 110 tons, blast furnace No. 3 for International Harvester Co.

CHICAGO, 100 tons, building for Hurley Machine Co.

CHICAGO, 1000 tons, garage on Plymouth Court.

MINNEAPOLIS, 275 tons, addition to memorial auditorium at University of Minnesota.

OLYMPIA, WASH., 133 tons, repair of bridge over Columbia River at Wenatchee; bids June 18.

SACRAMENTO, CAL., 605 tons, overhead crossing at Barstow; bids June 12.

To Study Protective Coatings for Buried Pipe

Funds to support a research associate at the Bureau of Standards to study protective pipe coatings have been voted by the American Gas Association. It is proposed to sand-blast mill run 2-in. pipe (supplied by National Tube Co.) and coat it in the manner specified by the manufacturer, cut the pipe in 2-ft. lengths, protect the ends by bitumen blocks, and bury the samples in soils representing extreme conditions.

Money is available to test about 15 varieties of coating and cooperation by manufacturers of the latter is invited. Each maker will be asked to submit the proper method of application, inspect the operation, and certify its correctness. The coating submitted for test must be a product currently manufactured and sold for the purpose, and well defined descriptions of its composition and physical characteristics must be placed on record.

Office Removals

Central Iron & Steel Co., Harrisburg, Pa., has removed its New York office from the Evening Post Building to suite 516 in the Cunard Building, 25 Broadway. Its Pittsburgh office has been removed from the Commonwealth Building to 1721 Oliver Building.

Joseph Monahan, machine tool dealer, Grand Rapids, Mich., has removed his offices to 321 Lake Michigan Drive.

Wagner Electric Corporation, St. Louis, has occupied a new service station and branch sales building at 1796 Main Street, Buffalo. The Buffalo office handles the entire Wagner line of motors, transformers, fans and Lockheed hydraulic brakes.

Chicago office of Ludlum Steel Co. will be removed on June 15 to Fulton and Elizabeth Streets. This will be a combined office of the Ludlum company and the former Atlas Steel Corporation, Dunkirk, N. Y., which was acquired by Ludlum about Jan. 1, last. Chicago office will be carried on under two divisions, the alloy steel division in charge of Paul E. Floyd and the tool steel division in charge of Harry Hardwicke.

Clark Brothers Bolt Co., Milldale, Conn., has moved its Detroit office to the General Motors Building. H. G. Wilson is in charge.

Charles J. Graham has moved his office to 2613 Grant Building, Pittsburgh.

Non-Ferrous Metal Markets

Copper More Active and Firm, Tin Dull and Easy, Lead Quiet and Steady, Zinc Inactive and Lower

NEW YORK, June 4.

Copper.—Demand is somewhat better, though not large. Foreign consumers are more active, having bought 1100 tons yesterday, 900 tons of which was for June shipment. A settlement of the reparations question may be a factor in influencing a more active market, but it is stated that European buyers must now purchase more metal anyhow. They still have considerable June and forward supplies to purchase. Domestic consumers, while well covered for June, are still buying some metal for that delivery, but are gradually adopting a hand-to-mouth policy, due to an assurance of plenty of copper and probably no higher prices, at least for some time. Production has been curtailed by several companies, but June may be the peak output. Reports that order books of copper consumers are not as satisfactory as might be desired are conflicting. Copper wire makers are apparently very busy and so are those which produce copper sheets, but some brass interests are not in such a satisfactory condition. Not much August metal has been purchased and there is still considerable for July to be bought. Prices hold very firm. Electrolytic copper is quoted unchanged at 18c., delivered in the Connecticut Valley, with the price of Copper Exporters, Inc., steady at 18.30c. c.i.f. usual European ports. Lake copper is moderately active with foreign and domestic sales in the past week largely for June shipment. It is quoted at 18c. to 18.12½c., delivered. Total sales for May were less than 30,000 tons, almost entirely sold by custom smelters who did not get rid of all their intake. Foreign sales for the month are estimated at not over 14,000 tons. Specifications on contract are very heavy, with June metal anticipated in May in some cases.

Copper Averages. — The average price of Lake copper for May, based on daily quotations in THE IRON AGE, was 18.12½c., delivered, New York. The average price of electrolytic copper was 17.75c., refinery, or 18c., delivered in the Connecticut Valley.

Tin.—Only about 300 tons of Straits tin was sold during the week ended June 1, and the market could scarcely be duller. The feature has been the pressure to sell nearby metal. Early delivery is cheaper than futures, and

THE WEEK'S PRICES, CENTS PER POUND FOR EARLY DELIVERY

	June 4	June 3	June 1	May 31	May 29
Lake copper, New York	18.12½	18.12½	18.12½	18.12½	18.12½
Electrolytic copper, N. Y.*	17.75	17.75	17.75	17.75	17.75
Straits tin, spot, N. Y.	43.62½	43.75	....	43.37½	43.50
Zinc, East St. Louis	6.55	6.55	6.60	6.60	6.60
Zinc, New York	6.90	6.90	6.95	6.95	6.95
Lead, St. Louis	6.80	6.80	6.80	6.80	6.75
Lead, New York	7.00	7.00	7.00	7.00	7.00

*Refinery quotation; price ¼c. higher delivered in the Connecticut Valley.

Rolled Products

Prices on rolled non-ferrous products are unchanged from those prevailing one week ago.

List Prices, Per Lb., f.o.b. Mill

On Copper and Brass Products, Freight up to 75c. per 100 Lb. Allowed on Shipments of 500 Lb. or Over

Sheets—
- High brass ..... 23.25c.
- Copper, hot rolled ..... 26.75c.
- Zinc ..... 10.25c.
- Lead (full sheets) ... 11.00c. to 11.25c.

Seamless Tubes—
- High brass ..... 28.25c.
- Copper ..... 29.25c.

Rods—
- High brass ..... 21.25c.
- Naval brass ..... 24.00c.

Wire—
- Copper ..... 19.87½c.
- High brass ..... 23.75c.

Copper in Rolls ..... 26.75c.
Brazed Brass Tubing ..... 30.87½c.

Aluminum Products in Ton Lots

The carload freight rate is allowed to destinations east of Mississippi River and also to St. Louis on shipments to points west of that river.

- Sheets, 0 to 10 gage, 3 to 30 in. wide ..... 33.00c.
- Tubes, base ..... 42.00c.
- Machine rods ..... 34.00c.

Chicago Warehouse

(Prices Cover Trucking to Customers' Doors in City Limits)

Sheets—	Base per Lb.
High brass	23.25c.
Copper, hot rolled	27.75c.
Copper, cold rolled, 14 oz. and heavier	30.00c.
Zinc	10.00c.
Lead, wide	11.90c.
Seamless Tubes—	
Brass	28.25c.
Copper	29.25c.
Brass Rods	21.25c.
Brazed Brass Tubes	31.00c.

New York or Cleveland Warehouse

Delivered Prices, Base Per Lb.

Sheets—
- High brass ..... 21.12½c. to 22.12½c.
- Copper, hot rolled, base sizes ..... 27.75c. to 28.75c.
- Copper, cold rolled 14 oz. and heavier, base sizes ..... 30.00c. to 31.00c.

Seamless Tubes—
- Brass ..... 26.00c. to 27.00c.
- Copper ..... 29.12½c. to 30.12½c.

Brazed Brass Tubes .. 29.12½c. to 30.12½c.
Brass Rods ..... 18.87½c. to 19.87½c.

New York Warehouse

Delivered Prices, Base Per Lb.

Zinc sheets (No. 9), casks ..... 10.50c. to 11.00c.
Zinc sheets, open ..... 11.50c. to 12.00c.

Metals from New York Warehouse

Delivered Prices, Per Lb.

- Tin, Straits pig ..... 45.50c. to 46.50c.
- Tin, bar ..... 47.50c. to 48.50c.
- Copper, Lake ..... 19.50c.
- Copper, electrolytic ..... 19.25c.
- Copper, casting ..... 19.00c.
- Zinc, slab ..... 7.75c. to 8.25c.
- Lead, American pig ..... 7.75c. to 8.25c.
- Lead, bar ..... 9.75c. to 10.25c.
- Antimony, Asiatic ..... 11.00c. to 11.50c.
- Aluminum No. 1 ingots for remelting (guaranteed over 99% pure) ..... 25.00c. to 26.00c.
- Alum. ingots, No. 12 alloy, ... 24.00c. to 25.00c.
- Babbitt metal, commercial grade, ... 30.00c. to 40.00c.
- Solder, ½ and ½ ..... 29.50c. to 30.50c.

Metals from Cleveland Warehouse

Delivered Prices Per Lb.

- Tin, Straits pig ..... 47.63c.
- Tin, bar ..... 49.63c.
- Copper, Lake ..... 19.50c.
- Copper, electrolytic ..... 19.25c.
- Copper, casting ..... 18.75c.
- Zinc, slab ..... 7.75c. to 8.00c.
- Lead, American pig ..... 7.75c. to 8.00c.
- Lead, bar ..... 10.00c.
- Antimony, Asiatic ..... 16.00c.
- Babbitt metal, medium grade ..... 19.00c.
- Babbitt metal, high grade ..... 51.63c.
- Solder, ½ and ½ ..... 30.00c.

Old Metals, Per Lb., New York

Buying prices represent what large dealers are paying for miscellaneous lots from smaller accumulators and selling prices are those charged customers after the metal has been properly prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	14.00c.	16.00c.
Copper, hvy. and wire	13.75c.	15.00c.
Copper, light and bottoms	12.00c.	13.00c.
Brass, heavy	8.25c.	9.00c.
Brass, light	7.00c.	8.00c.
Hvy. machine composition	11.25c.	12.50c.
No. 1 yel. brass turnings	9.25c.	10.00c.
No. 1 red brass or compos. turnings	11.00c.	12.00c.
Lead, heavy	5.50c.	6.00c.
Lead, tea	4.50c.	5.50c.
Zinc	3.50c.	4.25c.
Sheet aluminum	14.00c.	16.00c.
Cast aluminum	12.50c.	14.50c.

spot Straits can be bought at 43.75c., while July delivery is held at 44c. to 44.12½c. It is a buyers' market and consumers are awaiting developments. They will not buy futures when they can buy nearby for less. They are also obtaining all the metal they want on old contracts. Spot Straits tin, in a dull market thus far this week, was quoted today at 43.62½c., New York. Prices in London today were about £3 per ton higher than a week ago, with spot standard quoted at £198 15s., future standard at £201 10s. and spot Straits at £201 15s. The Singapore price today was £203 15s.

Lead.—Buying has been better in the last few days than for some time. Contracts have been mostly for prompt delivery, though considerable July metal was sold today. The market is a little higher at St. Louis, the prevailing quotation being 6.80c. The contract price of the leading interest continues unchanged at 7c., New York.

Zinc. — Sellers report scarcely enough demand to establish a definite market price. Some are still holding at 6.80c., East St. Louis, but undoubtedly there is metal enough to satisfy the light demand at 6.55c. to 6.60c. A fair appraisal seems to be 6.55c., for early delivery, with third quarter at 6.60c., minimum. Again the ore price remained unchanged last week at $44, Joplin, with a further decline in output, estimated at 11,800 tons. Production is now about 25 per cent less than at the high point in April. Ore sales fell off to 9300 tons. Shipments did not equal production, so that the stocks have increased and are now estimated at 35,300 tons.

Antimony.—Chinese metal is a little weaker at 8.87½c. per lb., duty paid, New York, in a dull market. Lower prices are partly caused by fluctuations in Chinese exchange.

Nickel.—Wholesale lots of ingot nickel are quoted at 35c. per lb., with shot nickel at 36c. and cathodes of electrolytic nickel at 35c.

Aluminum.—Virgin metal, 98 to 99 per cent pure, is obtainable at the published price of 23.90c. per lb., delivered.

Non-Ferrous Metals at Chicago

CHICAGO, June 4.—New sales in the Chicago non-ferrous market are spotty and in small volume. Prices for lead are higher, while quotations for antimony are off ½c. The old metal market is quiet.

Prices per lb., in carload lots: Lake copper, 18.12½c.; tin, 44.50c,; lead, 6.90c.; zinc, 6.62½c.; in less-than-carload lots: antimony, 10c. On old metals we quote copper wire, crucible shapes and copper clips, 14.50c.; copper bottoms, 11.50c.; red brass, 11.50c.; yellow brass, 8c.; lead pipe, 4.50c.; zinc, 3.75c.; pewter, No. 1, 24.50c.; tin foil, 26c.; block tin, 36c.; aluminum, 12.87½c.; all being dealers' prices for less-than-carload lots.

Soviet Union Has Closed Large Contracts Here

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In commemoration of the 50th anniversary of the incandescent lamp, an "Edison Fellowship for Research" has been established by the General Electric Co. research laboratory at Schenectady, N. Y. Its object is to help determine the fitness of the fellow for industrial or scientific research. This opportunity will be given to the selected candidate who has adequate training and who has done sufficient original work to have indicated an aptitude for research. The year's fellowship carries a grant of $3,000.

The choice of research work will be influenced by the preference of the individual, and may be the continuation of studies already begun at college if suitable laboratory facilities are available, or the fellow may work on new or specially selected projects, either independently or in cooperation with others.

Applicants should send to the director of the Research Laboratory, General Electric Co., Schenectady, N. Y., before July 4, relevant information about his training, a recent photograph, and should arrange for a separate letter of recommendation to be forwarded by someone with whom he has done original scientific work.

Warren Rolling Mill Co. to Take Over Warren Mill

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Austin Co. of Texas has occupied new quarters in the Allen Building, Dallas, and all construction work will be handled from there for the Southwest territory, including Oklahoma, Arkansas, Louisiana, New Mexico and Texas. A. Glenn Oldfield is vice-president in charge.

spot Straits can be bought at 43.75c., while July delivery is held at 44c. to 44.12½c. It is a buyers' market and consumers are awaiting developments. They will not buy futures when they can buy nearby for less. They are also obtaining all the metal they want on old contracts. Spot Straits tin, in a dull market thus far this week, was quoted today at 43.62½c., New York. Prices in London today were about £3 per ton higher than a week ago, with spot standard quoted at £198 15s., future standard at £201 10s. and spot Straits at £201 15s. The Singapore price today was £203 15s.

Lead.—Buying has been better in the last few days than for some time. Contracts have been mostly for prompt delivery, though considerable July metal was sold today. The market is a little higher at St. Louis, the prevailing quotation being 6.80c. The contract price of the leading interest continues unchanged at 7c., New York.

Zinc. — Sellers report scarcely enough demand to establish a definite market price. Some are still holding at 6.80c., East St. Louis, but undoubtedly there is metal enough to satisfy the light demand at 6.55c. to 6.60c. A fair appraisal seems to be 6.55c., for early delivery, with third quarter at 6.60c., minimum. Again the ore price remained unchanged last week at $44, Joplin, with a further decline in output, estimated at 11,800 tons. Production is now about 25 per cent less than at the high point in April. Ore sales fell off to 9300 tons. Shipments did not equal production, so that the stocks have increased and are now estimated at 35,300 tons.

Antimony.—Chinese metal is a little weaker at 8.87½c. per lb., duty paid, New York, in a dull market. Lower prices are partly caused by fluctuations in Chinese exchange.

Nickel.—Wholesale lots of ingot nickel are quoted at 35c. per lb., with shot nickel at 36c. and cathodes of electrolytic nickel at 35c.

Aluminum.—Virgin metal, 98 to 99 per cent pure, is obtainable at the published price of 23.90c. per lb., delivered.

Non-Ferrous Metals at Chicago

CHICAGO, June 4.—New sales in the Chicago non-ferrous market are spotty and in small volume. Prices for lead are higher, while quotations for antimony are off ½c. The old metal market is quiet.

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Work Begun on Warren Pipe Plant at Everett

The Warren Foundry & Pipe Co., New York, is leveling off ground on property recently acquired at Everett, Mass., preparatory to constructing a cast iron pipe foundry. The first unit of the plant will have a capacity of 3000 tons a month of various sizes of bell and spigot pipe for gas and water lines. The method of manufacture will be the sand spun centrifugal process in which the Warren company is interested as part owner of patents.

The site is adjacent to the Mystic Iron Works blast furnace and the by-product coke plant of the New England Fuel Co., from which the property was purchased. Both of these interests are subsidiaries of the Massachusetts Gas Co.

Pig iron and coke will be delivered to the pipe foundry over tracks of the New England Fuel Co. railroad. Facilities for deep water transportation are at hand at the docks of the Mystic furnace on the Charles River. The foundry, when operating at capacity, will employ 130 men.

Steel Ties Being Tried by British Railroads

The annual consumption of railroad ties in the United Kingdom is about 4,500,000. Normal yearly replacement of worn-out wooden ties with steel ties would require 300,000 tons of steel, 750,000 tons of iron ore, 150,000 tons of limestone and 1,000,000 tons of coal. The amount of iron ore required alone is equal to the output of the entire British industry for six weeks. The 300,000 tons of steel represents two weeks' output of the steel mills.

A practical experiment with steel ties is being carried out in Britain by the Great Western Railway near Risca and Twyford, in the Welsh mining valleys. At Risca half a mile of track has been relaid with steel ties. At this point 40,000 tons of traffic passes over the line every 24 hr. Near Twyford the line is being tested for its reactions to high-speed passenger train traffic on a curve.

In addition, an experimental length of line is to be laid in the main line opposite the locomotive shops at Swindon, with 8-ft. and 8-ft. 6-in. steel ties and 8-ft. 6-in. wooden ties, to enable comparative deflection tests to be taken under fast running conditions on a straight road. The experience gained so far has been satisfactory, and no special difficulty has been experienced in maintaining the line.

Last December the Southern Railway of Britain placed an order for 70,000 steel ties, equal to about 5000 tons of steel. These would suffice for the relaying of only 35 miles of track. Before going over to steel ties as standard the Southern Railway experimented on its London-Portsmouth line, over which pass locomotives of the heaviest type. The results entirely satisfied technical experts.

While all four of the big railroad groups operating in Britain are actively experimenting with steel ties, none of the other three feels that the tests have been sufficiently conclusive to follow the Southern Railway's example.

An official of the London & Northeastern Railway stated in an interview that it was largely a question of the life of the ties. The life of the average wooden tie is known, but that of a steel tie can be determined only by experiment. The experience of the German railroads (where the average life of a steel tie is estimated at 30 years, compared with about 20 years for a wooden tie) must be accepted with reservations, since widely different climatic conditions have to be considered.

Department of Commerce Building

WASHINGTON, June 4.—President Hoover will lay the corner stone of the Department of Commerce building next Monday and will deliver the principal address at the ceremonies. Under the present plans of the administration this will be the largest of the new Federal buildings in the development of the Pennsylvania Avenue triangle, containing about 1,092,000 sq. ft. of floor space. It will occupy three city squares, extending from B to E Streets and from Fourteenth to Fifteenth Streets. Congress has authorized its construction at a cost not to exceed $17,500,000. The building will provide quarters for all of the activities of the department in Washington with the exception of the Bureau of Standards, which of necessity is housed in specially constructed buildings in the suburbs. Secretary of Commerce Lamont will be in charge of the corner stone laying ceremonies, and will deliver an address.

Zinc Production

A summary of a great mass of statistical data on zinc production is presented in a series of interesting diagrams in Economic Paper No. 2, Bureau of Mines, Washington. A striking suggestion of the rate at which world production has increased is given in the following ratios of total zinc produced in the respective 25-year periods:

1801-1825	1
1826-1850	9
1851-1875	46
1876-1900	143
1901-1925	339

OBITUARY

ELLIOTT KEBLER, until Jan. 1, 1928, president of Fawcus Machine Co., Pittsburgh, now a division of Gears & Forgings, Inc., Cleveland, died in Pittsburgh on May 31, aged 69 years. He had been identified with the Fawcus company since its inception in 1900. He was the first secretary and held that position until he was elected president about ten years ago. He was also identified for a number of years with the pig iron industry, having been Pittsburgh district manager for Mathew Addy & Co. He had retired from active business about the time of the absorption of the Fawcus company by Gears & Forgings, Inc.

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WILLARD B. CALKINS, general purchasing agent of the Willys-Overland Co., Toledo, Ohio, died in Baltimore on June 1, aged 36 years. Prior to 1920 he was assistant purchasing agent of the Buick Motor Co., at Flint, Mich.

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C. W. TESCH, superintendent of the Muncie, Ind., bolt and nut plant of the Republic Iron & Steel Co., died May 23, aged 42 years. He had been connected with the Republic company for 15 years.

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MURRAY SHIPLEY, retired machine tool manufacturer, died at his home in Cincinnati on May 29 after a short illness, aged 65 years. He retired in July, 1917, from the firm of Lodge & Shipley Machine Tool Co., Cincinnati, which he organized with William Lodge in 1893. He was active for many years in the machine tool industry and was one of the founders of the National Machine Tool Builders' Association. He also was identified with the National Metal Trades Association, of which he was at one time vice-president and a member of the administrative council. In the Cincinnati branch he served as vice-president and later as president.

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THOMAS WRAY, vice-president and manager of the Washburn Wire Co., Providence, R. I., died Friday, May 24, aged 55 years.

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E. L. DALTON, vice-president and traffic manager, American Radiator Co., Chicago, died May 29. He was prominent in traffic work, having been an active member of the National Industrial Traffic League and a past-president of the Traffic Club of Chicago.

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EDGAR A. FLETCHER, long identified with the New England pump business, died at his home in Athol, Mass., May 31, aged 62 years. About two years ago he sold out his business, the Athol Pump Co., to the Leavitt Machine Co., Orange, Mass.

Machinery Markets and News of the Works

Machinery Orders Off

Sales in May Not Quite Up to Those of April—Outlook for Continued Buying Is Good

A SLIGHT falling off in the volume of machine tool buying in May, as compared with April, is without its usual significance, considering that machine tool companies have sufficient unfilled orders to assure a maintenance of present working schedules through the summer.

All companies, however, do not report a downward trend. A Cleveland turret lathe manufacturer in May broke all previous records except in war time, and some tool builders in the Cincinnati district had larger sales last month than in April.

It is said in the machine tool trade that the present run of orders is the most widely diversified the industry has ever known. Virtually all classes of buyers have recently been in the market.

While in some sections a decline is noticed in the number of inquiries, the total of pending business is large enough to indicate that June business will be good.

One of the outstanding sales of the week was for export. A European automobile manufacturer placed an order with a Cincinnati company for special lathes, requiring an expenditure of more than $60,000. Members of a commission from Soviet Russia, who have been in this country for some time studying machine tool requirements for a tractor plant at Leningrad, are said to be about to place orders totaling $1,000,000.

New York

NEW YORK, June 4.—Machine tool business in May in this district fell slightly below that of April. Prospects are good for a continuance of active buying through June. Inquiries are less numerous, but are in sufficient volume to indicate that there will be no sharp letdown in buying. Orders could fall off considerably during the summer months without materially affecting operations at machine tool plants, which have unfilled orders on hand that will maintain present working schedules for two or three months, at least.

Contract has been let by National Casket Co., 470 Jackson Avenue, Long Island City, to E. E. Paul & Co., 101 Park Avenue, New York, for six-story addition, to cost about $200,000 with equipment. Stein & Vitolo, 56 West Forty-fifth Street, New York, are architects.

Chrysler Motors, Inc., 1745 Broadway, New York, with main plants at Detroit, has plans for an eight-story service, repair and garage building on West End Avenue, with foundations to provide for four additional floors, to cost over $500,000 with equipment.

Metropolitan Engineering Co., 1250 Atlantic Avenue, Brooklyn, manufacturer of protective devices and equipment, has plans for a two-story plant, to cost about $45,000 with equipment. E. W. Helms, 88 Lexington Avenue, New York, is architect.

Board of Transportation, 49 Lafayette Street, New York, John H. Delaney, chairman, will receive bids until June 11 for rails, frogs, switches and other rail contact materials for rapid transit system. Francis J. Sinnott is secretary.

Following recent acquisition of plant of Brighton Mills, Inc., Passaic, N. J., by Charles Freshman Co., 240 West Fortieth Street, New York, manufacturer of radio sets and equipment, last-noted company will concentrate production at that location. All machinery from plant of Freed-Eiseman Radio Co., Brooklyn, a subsidiary, will be removed to new plant. Present output of about 500 radio sets daily will be increased to 1000 sets. Col. C. M. Tichenor is vice-president in charge of manufacture.

F. E. O'Rourke, 29-28 Hunters Point Avenue, Long Island City, engineer, has plans for a one-story machine shop, 92 x 120 ft., to cost about $50,000 with equipment.

General Outdoor Advertising Co., 1 Park Avenue, New York, has leased entire building of Reo Motor Car Co., 150th Street, between Gerard and River Avenues, totaling about 25,000 sq. ft. floor space, for main plant to manufacture signs, displays, etc. Part of property will be used as service, repair and garage unit for company cars and trucks.

Master Craftsman, Inc., 33-24 Lawrence Street, Flushing, L. I., manufacturer of furniture, has awarded general contract to Dally, Hayden & Treat, 70 East Forty-fifth Street, New York, for five-story addition, to cost about $100,000 with equipment. Lockwood, Greene Engineers, Inc., Pershing Square, is architect and engineer.

New Era Motors, Inc., New York, care of W. V. Ruxton of Spencer, Trask & Co., 25 Broad Street, investment securities, recently formed by Mr. Ruxton and associates with capital of $5,000,000, plans establishment of new plant to manufacture front wheel drive pleasure automobiles, to be known as the Ruxton; works will include both parts and assembling departments. A. M. Andrews, a director of Hupp Motor Car Corporation, Detroit, will be one of heads of new organization.

Officials of National Carbon Co., Inc., 30 East Forty-second Street, New York, manufacturer of batteries, etc., have organized new company, Raytheon Production Corporation, a subsidiary, to take over property and assets of Raytheon Mfg. Co., Cambridge, Mass., manufacturer of radio tubes and equipment, to be marketed as Eveready-Raytheon products. In assuming production and distribution of Raytheon organization, National Carbon Co. has agreed to invest $500,000 for development in manufacture and facilities.

Wright Aeronautical Corporation, Lewis Street, Paterson, N. J., will increase expansion program now under way and has plans for one-story units to cost more than $500,000 with equipment. John W. Ferguson Co., 152 Market Street, is engineer and contractor.

Columbia Tool Steel Co., 552 West Lake Street, Chicago, has leased a one-story building at 85-87 Poplar Street, Newark, for Eastern factory branch and distributing plant.

American Platinum Works, Inc., 231 New Jersey Railroad Avenue, Newark, has rejected bids recently received for one and one-half story addition, 40 x 125 ft., to cost about $50,000 with equipment, and expects to ask new bids on revised plans. Frederick A. Phelps, 21 Fulton Street, is architect and engineer.

Ballwood Co., Central Avenue and Baker Street, Passaic, N. J., manufacturer of pipe bends, flanges, etc., a division of Midwest Piping & Supply Co., St. Louis, has filed plans for one-story addition, to cost about $60,000 with equipment. Eastern headquarters are at 30 Church Street, New York.

Western Electric Co., 195 Broadway, New York, manufacturer of telephone equipment, radio apparatus, etc., has purchased assembling plant of Ford Motor Co., at Kearny, N. J., adjoining its works, and will equip and operate in conjunction with present Kearny plant. Ford company recently acquired property at Edgewater, N. J., and will build new assembling

plant for export trade, to cost more than $10,000,000. It is proposed to vacate larger portion of Kearny plant at early date.

Jordan Hardware Corporation has been incorporated and has succeeded to business of Jordan Trading Co., 14 West Seventeenth Street, New York. It desires to hear from drop forging plants, stamping works and foundries which are in position to manufacture a low-priced line of hand tools. Company also is in market for surplus lots of tools.

Philadelphia

PHILADELPHIA, June 3.—Sinclair Refining Co., 45 Nassau Street, New York, is reported planning extensions and improvements in oil refinery at Marcus Hook, Pa., to cost more than $350,000. Company has recently arranged for increase in capital to $10,000,000.

West Philadelphia Motor Co., 4227 Chestnut Street, West Philadelphia, has asked bids on general contract for two-story and basement service, repair and garage building, 65 x 215 ft., to cost over $100,000 with equipment. Philip S. Tyre, 114 South Fifteenth Street, is architect.

Purchasing Department, Day & Zimmermann Engineering & Construction Co., 112 North Broad Street, Philadelphia, is asking bids until June 17 for cell door locks and group locking devices for cell houses at new Eastern State Penitentiary, Graterford, Pa.

Quaker City Iron Works, Tioga and Richmond Streets, Philadelphia, has acquired property on Ontario Street and plans early construction of new unit, to cost more than $60,000 with equipment.

I. Fischman & Sons, Tenth Street and Allegheny Avenue, Philadelphia, manufacturers of soda fountains and equipment, have purchased plant and business of Stanley H. Knight Co., 216 West Superior Street, Chicago, manufacturer of kindred apparatus, and will operate as unit of organization. Acquired company will maintain present identity and Chicago plant will be continued largely as an assembling works, with production confined to soda fountain equipment as manufactured by parent company. Fischman company has work under way on new plant at Philadelphia, to cost $1,400,000 with machinery, and will remove to that location.

Columbia Malleable Castings Co., Second and Linden Streets, Columbia, Pa., has plans for one-story foundry addition, to cost about $50,000 with equipment. John H. Wickersham, Appel Building, Lancaster, Pa., is architect.

Lehigh & New England Terminal Co., Bethlehem, Pa., has plans for new one-story ice-manufacturing plant, to cost about $65,000 with equipment.

Ronald R. Williams, Norristown, Pa., and associates have organized Turbo Knitting Machine Co., with capital of $200,000, to manufacture knitting machines and parts, and plans operation of plant at Lansdale, Pa. Ludwig Schierenbeck, also of Norristown, will be an official of company.

Board of Education, Royersford, Pa., is considering manual training department in two-story junior high school, to cost $200,000, for which plans will be drawn by W. Marshall Hughes, 147 North Fifth Street, Reading, Pa., architect.

The Crane Market

A MODERATE volume of inquiry is in the market for overhead traveling cranes, but buying has been rather small in the past week. The National Tube Co., which recently closed on a list of overhead cranes for Lorain, Ohio, has asked for bids on a large capacity overhead crane for McKeesport, Pa. Inquiry for locomotive cranes is active, but few purchases have been made in the past week. In the Chicago district the Elgin, Joliet & Eastern Railroad is in the market for a 5-ton electric traveling crane.

Among recent purchases are:

Erie Railroad, New York, two 25-ton locomotive cranes reported from Ohio Locomotive Crane Co.

Patrick McGovern, Inc., New York, 20 small capacity shovels for Yonkers-Brooklyn water tunnel from Osgood Co.

Nash Motors Co., Kenosha, Wis., two overhead cranes for new steel foundry from Milwaukee Electric Crane & Mfg. Corporation.

Standard Underground Cable Co., St. Louis, 15-ton, 20-ft. span electric traveling crane from Shaw Electric Crane Co.

Stupp Bridge & Iron Co., St. Louis, 5-ton, 50-ft. span electric crane from Shaw Electric Crane Co.

Chicago, Milwaukee, St. Paul & Pacific Railroad, locomotive crane from Orton Crane & Shovel Co.

Woodward-Wanger Co., 1106 Spring Garden Street, Philadelphia, plumbing equipment and supplies, plans rebuilding of storage and distributing plant recently destroyed by fire.

Dewalt Products Co., Leola, Pa., manufacturer of wood-working machinery and parts, has plans for one and two-story plant near Lancaster, Pa., 100 x 225 ft., to cost about $65,000 with equipment. H. Y. Shaub, 20½ North Queen Street, Lancaster, is architect.

School Building Commission for Middletown District, Middletown, Del., is asking bids until June 19 for manual training and other school equipment, as per specifications on file at office of Delaware School Foundation, room 4116, duPont Building, Wilmington.

New England

BOSTON, June 3.—Business among machine tool representatives the past week was spotty and smaller in volume than in the previous week. Some orders were placed for rather extended deliveries and included planers, boring and drilling machines, shears and punches. The general run of business, however, was for smaller equipment. Used tool sales are limited by a lack of suitable equipment.

Demand for small tools is unabated, and manufacturers are steadily falling behind on deliveries.

A. G. Spalding & Brothers, Center Street, Chicopee, Mass., have closed bids on a two-story machine shop, 30 x 100 ft., and one-story forging plant, 38 x 84 ft.

North Dighton Stove Co., Railroad Avenue, Taunton, Mass., has plans for a new foundry and manufacturing units to replace those recently destroyed by fire.

Remington-Noiseless Typewriter Co., Middletown, Conn., plans to double present production. No additional floor space is contemplated, but new equipment may be purchased. Screw department will be moved to Ilion, N. Y.

Contract has been let by Spartan Saw Works, 152 Fish Avenue, Springfield, Mass., to J. G. Roy & Sons Co., 21 Silver Street, for one-story addition and improvements in present plant, to cost about $35,000 with equipment.

Hartford Electric Light Co., Hartford, Conn., has work under way on three-story equipment service and distributing plant, 160 x 180 ft., to cost over $125,000. General contract recently was let to Industrial Construction Co.

Malden Electric Co., Malden, Mass., has purchased adjoining property, totaling about 65,000 sq. ft., and plans erection of new equipment storage and distributing plant.

H. K. Porter, Inc., Ashland Avenue, Everett, Mass., manufacturer of wire cutters, bolt clippers, etc., has awarded general contract to Curtis & Swift, Inc., 80 Boylston Street, Boston, for one-story addition, 80 x 120 ft., to cost about $55,000 with equipment.

Phillips & Mason Rubber Co., Providence, R. I., plans rebuilding part of mill destroyed by fire May 25, with loss reported in excess of $200,000. Bulk of damage was in cutting division.

Firestone Tire & Rubber Co., Akron, Ohio, will make improvements in branch plant at Fall River, Mass., including installation of machinery to cost more than $100,000.

New England Mfg. Co., Stamford, Conn., manufacturer of mechanical equipment, has recently taken over Eagle Tool & Machine Co., same city, and will operate as a unit of organization.

South Atlantic

BALTIMORE, June 3.—Bids will soon be asked by Celanese Corporation of America, Inc., Amcelle, near Cumberland, Md., for a one and one-half story turbine house, to cost $150,000 with machinery. F. T. Small is company engineer.

Procter & Gamble Mfg. Co., Sixth and Main Streets, Cincinnati, has asked bids on general contract for initial units of new soap-manufacturing plant in Locust Point district, Baltimore, including machine shop and other mechanical departments, to cost $3,500,000 with equipment. Henry Manley, 5 East Fifty-third Street, New York, is architect.

Massanutten Power Co., Shenandoah, Va., operated by Page Power Co., Luray, Va., is planning extensions and improvements in local steam-operated electric power plant, to cost close to $100,000. W. C. Whitner & Co., Inc., Electric Building, Richmond, Va., is engineer. Parent company is arranging for merger with Madison Power Co., operating at Madison Courthouse, Va., and will carry out expansion program, including construction of high-tension transmission line from Luray to Madison Courthouse.

Palmer & Lambdin, 513 North Charles Street, Baltimore, architects, have plans for five-story automobile service, repair and garage building, 60 x 185 ft., to cost over $135,000 with equipment.

Department of Public Works, Lynchburg, Va., will establish municipal airport at city farm property, including construction of hangars, repair shops and

other buildings, to cost more than $75,000. D. M. Knight is director.

Board of Trustees, Crownsville State Hospital, Crownsville, Md., has plans for one-story central steam power plant, to cost more than $75,000 with equipment. J. Evans Sperry, Calvert Building, Baltimore, is architect; James Posey, 201 West Franklin Street, Baltimore, is mechanical engineer.

Atlantic Seaboard Airways, Inc., Washington, recently organized to take over and consolidate International Airways, Inc., and Potomac Flying Service, Inc., both with air terminals at Washington, and Gettysburg Flying Service, Inc., Gettysburg, Pa., has arranged for stock issue to total $750,000, part of fund to be used for expansion, including new airports, with hangars, repair shops and other units. C. L. Ofenstein is president.

Coca-Cola Bottling Co., Rome, Ga., has plans for two-story and basement bottling plant, with automatic bottling, capping, conveying and other equipment, to cost about $80,000. Pringle & Smith, Norris Building, Atlanta, Ga., are architects.

Singer Sewing Machine Co., 149 Broadway, New York, has awarded general contract to Arthur R. Meyers, Atlanta, Ga., for one-story factory branch and distributing plant at Atlanta, to cost $30,000 with equipment.

Chevrolet Motor Co., Detroit, has awarded general contract to Davis Brothers, Inc., Builders' Exchange, Richmond, Va., for two-story factory branch and distributing plant, 150 x 180 ft., at Richmond, to cost about $180,000 with equipment.

O. S. Jennings, 3025 Gwyns Falls Parkway, Baltimore, who was president and owner until recently of Novelty Steam Boiler Works Co., Baltimore, has acquired a building and is considering establishment of a new tank and boiler shop. He is interested in used machinery and steel for general steel plate and structural work.

Pittsburgh

PITTSBURGH, June 3.—May proved a satisfactory month to most machinery dealers in this district, although a few report slight declines as compared with April. However, considerable inquiry developed and prospects are generally considered better than a month ago. The Westinghouse Electric & Mfg. Co. is still making purchases against its second quarter list and a few miscellaneous items have been placed recently by the railroads.

Continued high operating schedules in steel plants are bringing out considerable equipment for repairs, replacements, etc., and in many cases the speed with which makers can arrange deliveries is the deciding factor in placing the order.

Plans have been approved by West Leechburg Steel Co., Farmers' Bank Building, Pittsburgh, for addition to mill at Leechburg, Pa., to cost about $750,000 with machinery; crane building and crane runway will be rebuilt and extended.

Oil Well supply Co., Clark Building, Pittsburgh, is said to be planning a one-story machine shop at Braddock works, to cost about $50,000 with equipment.

Main Aeronautics Co., Pittsburgh, care of Frank Wilbur Main, Farmers' Bank Building, recently formed by Mr. Main and associates, is concluding arrangements for purchase of 700 acre tract at Greensburg, Pa., for new airport, to include hangars, repair shops, oil storage and other buildings, to cost more than $100,000. M. R. Scharff and L. B. Foster, both of Pittsburgh, are also interested in new organization.

United Zinc Smelting Corporation, Moundsville, W. Va., is planning extensions and improvements, including installation of roadsters and other equipment, to cost about $225,000.

American Austin Motor Car Co., Inc., 100 Broadway, New York, H. H. Stockfield, head, affiliated with Austin Motor Co., Ltd., London, England, has closed contract with Standard Steel Car Co., Frick Building, Pittsburgh, for purchase of part of plant at Butler, Pa., and will take possession soon. Company is arranging for financing, comprising sale of about 500,000 shares of stock, part of proceeds to be used for plant development.

Board of Education, Beaver Falls, Pa., is planning installation of manual training equipment in new high school, to cost $250,000. Carlisle & Sharrer, Martin Building, Pittsburgh, are architects.

American Machine & Engineering Corporation, 1411 Reedsdale Street, Pittsburgh, has been incorporated with capital stock of $25,000 to manufacture capstans, steering gears and machinery for steamboats. It will also do a general machine shop business. A building has been leased and equipment purchased. John B. Walker is president and Howard B. Kirchner, secretary-treasurer.

Detroit

DETROIT, June 3.—Contract has been let by Kalamazoo Vegetable Parchment Co., Riverview Drive, Kalamazoo, Mich., to O. F. Miller Co., Pratt Building, for one-story addition to paper mill, to cost $100,000 with machinery. Billingham & Cobb, 120 Woodward Avenue, are architects.

Auto Specialties Mfg. Co., Edgewater Street, St. Joseph, Mich., will soon begin work on one-story addition, to cost about $150,000 with equipment, for which plans are being completed by F. E. Davidson, 53 West Jackson Boulevard, Chicago, architect. Larger part of new unit will be used as a foundry.

Board of Education, Hillsdale, Mich., is planning installation of manual training equipment in new two-story high school to cost $250,000, for which plans will be drawn by W. S. Holmes Co., Capitol Savings & Loan Building, Lansing, Mich., architect.

City Council, Petoskey, Mich., is completing plans for airport, in conjunction with Board of County Commissioners, to include hangars, repair shops and other units, to cost more than $80,000.

Eureka Vacuum Cleaner Co., Hamilton Street and Dewey Avenue, Detroit, has awarded general contract to W. S. Pocock, 1726 Seward Avenue, for two-story plant unit for storage and distribution, to cost about $50,000 with equipment. Weston & Ellington, Stroh Building, are architects.

Detroit Insulated Wire Co., 4647 Wesson Avenue, Detroit, has begun work on one-story addition, for which general contract recently was let to Cooper-Little Co., 4612 Woodward Avenue, to cost over $40,000 with equipment.

Detroit Steel Products Co., 2250 East Grand Boulevard, Detroit, is said to be planning one-story addition, to cost more than $50,000 with equipment.

Michigan Bell Telephone Co., 1365 Cass Avenue, Detroit, is considering construction of a two-story equipment storage and distributing plant at Grand Rapids, Mich., with repair facilities, to cost over $65,000.

Sparta Foundry Co., Sparta, Mich., informs THE IRON AGE that a recent report that it had purchased plant and business of another piston ring company is incorrect. Sparta company is undergoing refinancing, but states that it has no intentions of purchasing an interest in any other piston ring company.

Buffalo

BUFFALO, June 3.—Martin & Schwartz, Inc., 2651 Main Street, Buffalo, manufacturer of oil equipment, has purchased plant and business of J. G. Doty Pump Co., St. Louis, manufacturer of visible pumping units, nozzles, ornamental iron lamp standards, etc., and will consolidate with organization. St. Louis plant will be continued as a branch works, primarily for assembling, adding its line of oil equipment. All products of Doty company will be manufactured as heretofore, with production concentrated at Buffalo plant.

Union Free School District, East Aurora, N. Y., is said to be planning installation of manual training equipment in three-story addition to high school, to cost $500,000, for which plans will be drawn by Aaron R. Merritt, Erie County Bank Building, Buffalo, architect.

Board of Contract and Supply, City Hall, Rochester, N. Y., is planning for new hangar with repair and reconditioning facilities at municipal airport, to cost about $35,000. C. A. Poole is city engineer.

Bates Valve Bag Corporation, 8200 South Chicago Avenue, Chicago, manufacturer of bag-filling machinery, has acquired property of Oswego Industries Corporation, Oswego, N. Y., and will soon break ground for new one-story branch plant, 200 x 400 ft., to cost more than $175,000 with equipment. Company is affiliated with St. Regis Paper Co., Watertown, N. Y.

Henry Siebert Sons, Inc., Rochester, N. Y., has been formed with a capital of $100,000 and 300 shares common stock, no par value, to take over and expand company of same name with local plant at 162 Andrews Street, manufacturer of stoves, heating equipment, etc. New company is headed by Elmer, Frank and E. Walter Siebert.

Cleveland

CLEVELAND, June 3.—Machine tool sales during May showed a slight decrease compared with April. Some manufacturers, however, were not affected by the decline. Sales by a local tuuret lathe builder during May broke all records except those during the war. Automatic screw machine business last month held closely to that in April. Orders are well scattered. Considerable business is coming from the automotive, electrical equipment and airplane industries.

The delivery situation has become worse and the extended shipping dates of some manufacturers have a tendency to slow down orders. Business during the week was confined mostly to single machines. The Chase Brass & Copper Co., purchased several tools for the maintenance depart-

ment of its new Cleveland plant, the orders being placed through its home office at Waterbury, Conn.

Lakeland Aviation, Inc., Cleveland, has been formed by James E. Mathews and others to manufacture amphibian airplanes. Option has been taken on a site at foot of East Thirty-eighth Street, owned by Cleveland Steel Co.

Bids have been asked by Cleveland Equipment Works of General Electric Co., Incandescent Lamp Division, 1175 East 152nd Street, Cleveland, for two one-story additions, to cost about $60,000 with equipment.

Timken Roller Bearing Co., Canton, Ohio, is taking bids on general contract for one-story addition, 100 x 800 ft., to cost about $225,000 with equipment.

Richard L. Cawood, president, Patterson Foundry & Machine Co., East Liverpool, Ohio, and associates are organizing Patterson Steel Products Co., to manufacture forged and welded steel specialties. A two-acre tract adjoining present plant has been secured and work will soon begin on initial units, to cost about $100,000 with equipment. New company will take over and consolidate Patterson Welding & Repair Co., which has been operating at former works of Patterson Foundry company on North Walnut Street, and will remove to new location. D. G. Rhue, mechanical engineer, formerly connected with Morgan Engineering Co., Alliance, Ohio, will be an official of new corporation.

Myers Machine & Tool Co., 3044 West Crane Boulevard, Detroit, is considering extensions and improvements in branch plant at Lima, Ohio, to cost about $45,000 with equipment.

Midland Steel Products Co., 10600 Madison Avenue, Cleveland, is arranging to use entire plant facilities to manufacture automobile frames, axle housings, parts, etc., and will discontinue production of steel freight car doors and kindred equipment. Departments now given over to last noted will be used for increased capacity of automobile products.

Plans are being arranged for a merger of India Tire & Rubber Co., Mogadore, Ohio, and Falls Rubber Co., Cuyahoga Falls, Ohio. Both lines of tires and other rubber goods will be continued and expansion carried out. W. G. Klauss, now president of India company, is expected to be head of consolidated organization.

Chicago

CHICAGO, June 3.—Machine tool business in this district is spotty. Some dealers found April a better month than May, while with others orders fell off. As a whole, however, sales held up remarkably well in view of the lateness of the season and the expectancy by the trade of comparatively light business. Motor car builders and farm equipment manufacturers continue to buy a few scattered tools. The Rock Island will buy a 20-in. x 8-ft. motor-driven lathe, an upright drill with 36-in. table, and a tool and cutter grinder.

Deliveries though far in the future in many lines are no longer advancing, and for some types of special machines promises of shipments can be made at earlier dates.

Jewel Emblem Mfg. Co., 1500 West Seventy-ninth Street, Chicago, will erect an addition, 46 x 78 ft. L. E. Wiener, 308 North Michigan Avenue, is architect.

Vandercook & Sons, 900 North Kilpatrick Street, Chicago, manufacturers of printing machinery, will build a one-story addition, 62 x 124 ft., to cost $20,000. B. H. Pistorius, 25 East Jackson Boulevard, is architect.

General Engineering Works, manufacturer of screw machine products, recently incorporated and continuing business conducted as a partnership under same name, is occupying a new plant at 4701 West Division Street, Chicago, and operating at capacity.

Decatur Castings Co., Decatur, Ill., has awarded contract to Austin Co. for a building, 80 x 180 ft.

Contract has been let by Peoria Malleable Castings Co., Alexander Street, Peoria, Ill., to W. M. Allen Sons & Co., Jefferson Building, for two-story addition, to cost about $35,000 with equipment. L. Eugene Robinson, Inc., Jefferson Building, is architect.

Chicago Coil Spring Co., Carroll and Albany Avenues, Chicago, has awarded general contract to J. E. Swanson, 6217 North Campbell Avenue, for one-story addition, 78 x 116 ft., to cost about $40,000 with equipment. W. C. Presto, 308 North Michigan Avenue, is architect.

City Council, Harlan, Iowa, is considering extensions and improvements in municipal electric light and power plant, including installation of equipment, to cost $135,000. A bond issue will soon be arranged.

Davenport Machine & Foundry Co., West Fourth Street, Davenport, Iowa, has plans for a one-story foundry addition, to cost about $50,000 with equipment. Clausen, Kruse & Klein, Kahl Building, are architects.

Hayes-Custer Stove & Furnace Co., Bloomington, Ill., is planning to rebuild part of plant destroyed by fire May 28, with loss close to $100,000 including equipment.

Willis Motors Corporation, North First Avenue, Maywood, Ill., manufacturer of gasoline motors, parts, etc., has plans by Godfrey E. Larson, 5154 North Clark Street, Chicago, architect, for one and two-story plant at Bensonville, Ill., comprising three units, each 60 x 1600 ft., to cost about $1,000,000 with machinery.

Thomas Engineering & Mfg. Co., 616 South Michigan Avenue, Chicago, manufacturer of radio equipment, parts, etc., is completing plans for new two-story plant at St. Charles, Ill., 50 x 120 ft., to cost about $55,000 with equipment.

Milwaukee

MILWAUKEE, June 3.—Sufficient machine tool business is being booked to keep shops in an oversold condition, and while there has been a slight letdown this is more or less welcomed by builders who have been under a heavy strain to execute orders promptly. Capacity production continues to be the rule and on the basis of unfilled orders, this rate will be maintained throughout the summer.

Kearney & Trecker Corporation, Milwaukee, manufacturer of milling machines, has acquired nearby plant of defunct Gerlinger Electric Steel Casting Co. at West Allis, and will remodel main foundry to serve both its own purposes and that of its subsidiary, LeRoi Co., manufacturer of gasoline engines.

Twin Disc Clutch Co., 1328 Racine Street, Racine, Wis., has placed contracts for a new heat treating building to increase capacity about 100 per cent. A new boiler house is under construction. Improvements will cost about $75,000. Company manufactures clutches, power take-offs, reduction gear units, etc.

Board of Vocational Education, La-Crosse, Wis., closes bids June 11 for erecting a second story on present building and two wing additions, 40 x 125 and 36 x 110 ft., to cost about $50,000. Merman & Skogstad, local architects, are in charge. G. M. Wiley is secretary.

Fox River Paper Co., 401 South Appleton Street, Appleton, Wis., has placed general contract with C. R. Meyer & Sons, 50 State Street, Oshkosh, Wis., for a two-story addition, 85 x 117 ft., to loft and finishing room, to cost about $65,000 complete.

Acme Iron & Steel Co., 1929 St. Paul Avenue, Milwaukee, will build a new plant and warehouse, one-story, 75 x 150 ft.

Chatfield Machine & Foundry Works, Marianette, Wis., recently suffered loss by fire to its foundry and blacksmith shop. Plans are under way for rebuilding.

Cincinnati

CINCINNATI, June 3.—The last few days of May brought a gain in the volume of orders received by machine tool builders, and sales for the month fell only slightly below April. In fact, several manufacturers report that business in the past 30 days showed an improvement over both March and April and almost reached the level attained in February, the peak month of the year. Inquiries continue heavy and indicate that bookings in June should be good. The general run of current business is the most diversified in the past decade, practically all classes of users having been in the market recently.

There has been a sharp increase in orders for repair parts for machines which are being put into service for the first time in several years. This is largely accounted for by the fact that deliveries of most new tools are so deferred that many users find it impossible to await their receipt. Most second-hand tools in this district have been cleaned out in the past month as a result of this condition.

A European automobile manufacturer has placed an order for special lathes with a local builder, the transaction calling for an expenditure of over $60,000. A few special lathes also have been sold to companies in Germany and in South America. Members of a commission from Soviet Russia who have been in this country for several months and who now are in Detroit are said to be about ready to purchase more than $1,000,000 worth of machine tools for a tractor plant to be built near Leningrad.

Procter & Gamble Co., Cincinnati, will expend about $1,400,000 in plant improvements and extensions, including purchase of special machinery, at its factories at Ivorydale, Ohio, Hamilton, Ont., and Staten Island, N. Y.

Bids will be asked this month by Stuebling-Cowan Co., 312 East Court Street, Cincinnati, manufacturer of lift trucks, platforms, etc., for one-story unit to cost $140,000 with machinery.

Burr Oak Belting Co., 1105 York Street, Cincinnati, manufacturer of mechanical belting, has plans for one-story addition, to cost $65,000 with equipment. T. A. Bienke, 21 Forest Avenue, Newport, Ky., is architect.

Francisco Heater Co., 640 Shoemaker Street, Columbus, Ohio, has begun erection of one-story storage and distributing plant, 125 x 200 ft., to cost about $40,000 with equipment.

City Council, Chattanooga, Tenn., will soon begin construction of municipal airport, including hangars, repair shops and other units. A fund of $250,000 has been arranged. Benjamin King & Associates, Hotel Patten Building, Chattanooga, are engineers.

Murray Corporation of America, Inc., Aberle Street, Detroit, manufacturer of automobile bodies, is planning construction of second unit at new branch plant at North Memphis, Tenn., to cost more than $1,500,000 with machinery. Addition will double capacity of present unit, which is now in course of erection. Initial plant will have a capacity for 1000 automobile bodies daily and will represent investment of about $2,000,000.

Chevrolet Motor Co., West Grand Boulevard, Detroit, is said to have plans for two-story and basement factory branch and distributing plant at Louisville, to cost $160,000 with equipment.

Dayton Rubber Mfg Co., Riverview Avenue, Dayton, Ohio, has plans for two-story addition, to cost $140,000 with equipment. Schenck & Williams, Third National Bank Building, are architects.

Ready Mixed Concrete Co., Quincy Avenue, Knoxville, Tenn., has awarded general contract to Wilson-Weesner-Wilkinson Co., 108 Fatherland Avenue, Nashville, Tenn., for new concrete mixing and cast stone plant, to cost more than $50,000 with equipment.

Prince Wells Co., 737 South Third Street, Louisville, operating an automobile parts and repair works, plans one story addition, 60 x 200 ft., including improvements in present shop, to cost about $40,000.

Indiana

INDIANAPOLIS, June 3.—Bids will soon be asked on general contract by C. A. Dunham Co., 450 East Ohio Street, Chicago, manufacturer of heating equipment, valves, pumping machinery, etc., for first unit of new plant at Michigan City, to cost more than $500,000 with equipment. Frank D. Chase, Inc., 720 North Michigan Avenue, Chicago, is architect and engineer.

Board of Education, Evansville, will receive bids until June 12 for new power plant at central high school, including two 250-hp. high-pressure watertube boilers, feed-water heater and other equipment. Thole & Legeman, American Trust Building, are architects.

Ford Motor Co., Detroit, has awarded general building contract to Krebay Construction Co., New City Trust Building, Indianapolis, for one-story addition to branch assembling plant at Indianapolis, to cost more than $200,000 with equipment. New unit will be equipped primarily for production of closed automobile bodies. George J. Steinmetz is manager of local branch.

Calumet Millwork Co., 1624 West Tenth Street, Gary, has awarded general contract to William & Patch, 757 Broadway, for two-story plant unit, to cost over $100,000 with equipment. H. Erickson, 222 West Fifth Avenue, is architect.

Automotive Gear Works, Inc., Richmond, has awarded general contract to Carl M. Guepel Construction Co., Hume-Mansur Building, for one-story building, 60 x 125 ft., and two-story structure, 40 x 60 ft., to cost $75,000 with equipment. Pierre & Wright, Hume-Mansur Building, are architects. C. E. Hamilton is president.

Arthur Chevrolet and other officials of Chevrolet Brothers Mfg. Co., 410 West Tenth Street, Indianapolis, manufacturer of cylinder heads and other engine equipment, have organized Arthur Chevrolet Air Motors Corporation to manufacture a new air-cooled aircraft motor, recently perfected by Mr. Chevrolet, to be known as Chevolair, developing about 110 hp. It is understood that part of present plant will be given over to production of new unit.

International Safety Gate Co., 715 Lemcke Building, Indianapolis, will manufacture an automatic gate to protect highway crossings over railroad tracks. Company will have these gates manufactured on contract for present. Ralph R. Scheidler is secretary.

Gulf States

BIRMINGHAM, June 3.—Plans are under way by H. L. & H. Co., 3019 Hamilton Street, Houston, Tex., G. A. Humason, president and general manager, manufacturer of pumping machinery, air valves, etc., for installation of new machine shop, to cost more than $35,000 with equipment.

Phillips Petroleum Co., Bartlesville, Okla., is planning construction of three new gasoline refineries in Gray County, Tex., with capacity of about 70,000 gal. per day, to cost over $80,000. John H. Kane is executive vice-president.

Gulf, Colorado & Santa Fe Railway Co., Galveston, Tex., has work under way on mechanical shops at Cleburne, Tex., to cost about $1,000,000 with machinery. F. Merritt is chief engineer.

Dallas Airport Utilities Corporation, Dallas, Tex., is arranging for sale of stock issue of $250,000, large part of fund to be used for construction of airport facilities at Love Field, including hangar, repair shop and other units.

Linde Air Products Co., 30 East Forty-second Street, New York, manufacturer of acetylene welding apparatus, etc., has awarded general contract to J. M. Brown, Ricon-Brewster Building, Shreveport, La., for second unit of plant at Agurs, to cost about $50,000 with equipment.

City Council, McAllen, Tex., will soon take bids on general contract for municipal airport, including hangars, repair shop, and other units, to cost $100,000 with equipment.

Texas Co., San Antonio, Tex., is planning new oil storage and distributing plant on local site, to cost about $70,000 with equipment.

Q. B. Andrews Co., Chattanooga, Tenn., manufacturer of corrugated fibre containers, folding boxes, etc., has leased property at New Orleans for establishment of branch plant, to cost about $100,000 with machinery. Local offices of company are in Audubon Building.

Greater Miami Brick Co., Bradenton, Fla., has plans for new plant at Melrose Heights, Miami, Fla., with main unit, one-story, 50 x 556 ft., and several smaller buildings, including boiler plant, to cost $70,000 with machinery.

Magnolia Gas Co., Dallas, Tex., has plans for construction of steel pipe line from Bruni, Webb County, to San Antonio, New Braunfels, Tex., and vicinity, about 230 miles, for natural gas service, to cost more than $1,500,000 with booster stations and other operating facilities.

St. Louis

ST. LOUIS, June 3.—Plans are under way by McGregor Hardware Co., 301 St. Louis Street, Springfield, Mo., for four-story storage and distributing plant, 100 x 145 ft., to cost about $100,000 with equipment. Earl Hawkins, McDaniel Building, is architect.

Mutual Ice & Cold Storage Co., 112 East First Street, Topeka, Kan., has plans for two-story cold storage and refrigerating plant, to cost about $50,000 with equipment. Thomas W. Williamson & Co., Central Bank Building, are architects.

Eagle Foundry Co., South Fourteenth Street, Belleville, Ill., will soon begin superstructure for one-story and basement plant at East St. Louis, Ill., 120 x 160 ft., to cost over $85,000 with equipment. Part of unit will be used for assembling.

Beacon Airways of America, Inc., Board of Trade Building, Kansas City, Mo., has plans for new aircraft manufacturing plant in Fairfax industrial district, Funston Road, to be one story 60 x 155 ft., with parts manufacture and assembling departments, to cost $90,000 with equipment. Clarence E. Shepard, Huntzinger Building, is architect.

C. C. Hawkins, Arkadelphia, Ark., is at head of project to construct a sand and gravel plant on local site, to include steel bins, hoisting and conveying equipment and other machinery, to cost close to $100,000.

State Board of Regents, Lincoln, Neb., has engaged Burns & McDonnell Engineering Co., Interstate Building, Kansas City, Mo., consulting engineer, to prepare plans for steam power plant at University of Nebraska, Lincoln, to cost $450,000 with equipment. James A. Dales is secretary.

Butler Aircraft Corporation, Kansas City, Mo., E. E. Norquist, president, is planning construction of new plant on 15-acre tract near municipal airport, consisting of main one-story unit, 80 x 115 ft., and two adjoining structures, each 50 x 80 ft., to cost about $70,000 with equipment.

Arrow Aircraft & Motors Corporation, Havelock, Neb., is reported planning establishment of assembling plants to manufacture 60 and 90-hp. biplane units, to be located in northern part of New York, Tampa, Fla., California, Quebec, and at London, England, each to cost over $50,000.

Board of Education, St. Louis, has approved plans for erection of a new central high school to cost $1,250,000, an intermediate school to cost $1,000,000, and units of a vocational training school to cost $1,500,000.

Pacific Coast

SAN FRANCISCO, May 29.—Contract has been let by Firestone Tire & Rubber Co., Akron, Ohio, to J. V. McNeil Co., 5860 Avalon Boulevard, Los Angeles, for additions to plant at South Gate, near Los Angeles, comprising two multi-story units, 180 x 460 ft., and five-story storage and distributing building, to cost more than $2,000,000 with machinery. Claude Beelman, Union Bank Building, Los Angeles, is architect. R. J. Cope is vice-president and general manager of Western plants.

Calumet & Arizona Mining Co., Lowell, near Bisbee, Ariz., is planning construction of steam-operated electric power

plant at local properties, to cost over $300,000 with equipment.

Reed Roller Bit Co., 3539 Alosta Street, Los Angeles, manufacturer of oil well equipment, has awarded general contract to Union Engineering Co., Huntington Park, Cal., for one-story addition, to cost about $18,000 with equipment.

Western Oil & Refining Co., Los Angeles, has plans for new gasoline refinery in harbor district at Wilmington, to cost about $2,750,000 with machinery.

G. A. Applegarth, Claus Spreckles Building, San Francisco, architect, has plans for ten-story automobile service, repair and garage building, to cost $325,000 with equipment.

Medford Ice & Storage Co., Medford, Ore., has plans for three-story ice and pre-cooling plant, 80 x 100 ft., to cost about $85,000 with machinery.

Fir-Tex Insulating Board Co., Pacific Building, Portland, Ore., has plans for new mill at St. Helens, Ore., to manufacture insulating and building board products, to cost more than $1,000,000 with equipment.

Ray Maling Fruit Canning Co., Hillsboro, Ore., has authorized rebuilding part of canning plant recently destroyed by fire, with loss reported over $300,000 including machinery.

Santa Paula School District, Santa Paula, Cal., has plans for a one-story manual training shop at local high school, to cost about $35,000 with equipment. Roy C. Wilson, 959 Main Street, Santa Paula, is architect.

John Bean Mfg. Co., San Francisco, manufacturer of machinery for canning and other food products plants, has purchased Stebler-Parker Co., Riverside, Cal., manufacturer of machinery for citrus packing industry, and will operate as unit under name of Stebler-Parker Division of John Bean Mfg. Co.

Canada

TORONTO, June 3.—Orders for machine tools during the week were mostly for single items, chiefly for replacement. Inquiries are in good volume and include several lists of six to a dozen tools for new plants and extensions. Work planned by the Algoma Steel Corporation, the Abitibi Power & Paper Co., and the Algoma District Power Co., indicates that about $5,000,000 will be spent on construction at Sault Ste. Marie, Ont., this year.

Welland Steel Castings, Ltd., Welland, Ont., whose plant was recently damaged by fire, will rebuild immediately. New building will be 60 ft. longer and the company will install a new annealing oven for heat treating stainless steel.

Roto Laundry Equipment Co., of which T. W. Chadburn, of Toronto Board of Trade, is president, will establish a plant in Toronto. Company has secured patent rights for Canada to manufacture Roto Laundry Equipment unit, made in United States by Roto Laundry Equipment Co., Inc., Des Moines, Iowa.

Smith Monument Co., Yonge Street, Toronto, has awarded contract to C. Stephenson, 60 Day Avenue, for one story plant. Engineer is John Stephen, 1 Wellington Street, West.

Eclipse Machine Co., Argyle Street, Walkerville, Ont., has awarded general contract to Christman, Burk & Co., and has also let a number of subtrades for erection of an addition to cost $100,000.

J. Ford, Portneuf Station, Que., contemplate erection of a three-story power house to cost $30,000.

Office Specialty Co., Newmarket, Ont., will start work at once on an addition, 55 x 200 ft. Wood-working tools and other machinery will be purchased.

Bids will be called about June 15 for construction of a match factory, 100 x 200 ft., at Hull, Que., for Hull Match Co., Ltd. Perry & Luke, 1190 University Street, Montreal, are architects.

Western Canada

British Columbia Electric Railway Co., Hastings and Carrall Streets, Vancouver, B. C., has awarded general contract to Morgan & McKee, 412 Shelly Building, for a three-story work shop to cost $40,000. McCarter & Nairne, 807 Northwest Building, are architects.

Royalite Oil Co., Ltd., 606 Second Street West, Calgary, Alta., has let contract to Construction Engineer, Ltd., 67 Union Building, Calgary, for a one-story machine shop at Turner Valley Oil Fields, Alberta, to cost $20,000.

Boeing Aircraft of Canada, Ltd., Vancouver, B. C., has awarded contract to Austin Co. of Canada, Ltd., for first unit of its airplane plant, to cost $100,000 with equipment.

Foreign

PLANS are under way by Ford Motor Co., Detroit, for new automobile assembling plant in Germany, for which site is being secured, to cost about $5,000,000 with equipment. A similar plant will be erected in France, where site is being selected near Paris, to cost a like sum. Construction will be rushed on new plant at Dagenham, Essex, England, recently noted, entire development, including proposed gas and coke works, to cost more than $15,000,000.

Intercontinents Power Co., operated under management of Gannett, Seelye & Fleming, Inc., 602 North Second Street, Harrisburg, Pa., engineer, with electric light and power properties in Argentina and Chile, known as S. A. Cia Sud Americana de Servicios Publicos, and S. A. Luz Electricia de Tres Arroyos, has arranged for a stock issue to total $2,500,000, part of fund to be used for expansion in power plants and system.

Electrolytic Zinc Co., Melbourne, Australia, with main plant in Tasmania, is said to have purchased site at Sydney, Australia, for new plant for production of lithopone and kindred products, to cost about $600,000 with machinery. Plant will adjoin works of British Australian Lead Manufacturers Pty., Ltd., which, it is understood, will be interested in project.

A power company at Buenos Aires, Argentina, is planning construction of a new electric generating station in New Port section of city, for which concession has been secured. It will have ultimate capacity of 500,000 hp. and is estimated to cost close to $26,000,000. Information at office of Bureau of Foreign and Domestic Commerce, Washington, reference Argentina No. 86923.

Handley Page, Ltd., London, England, manufacturer of military and commercial aircraft, is disposing of stock issue to total $3,236,000, part of proceeds to be used for expansion and development. F. Handley Page is managing director.

Soviet Russian Government, Moscow, has granted a concession for construction of a steam-operated electric generating plant in Urals district, near Cheliabinsk, with initial capacity of 60,000 kw., to include construction of transmission lines for power service to steel, copper and other metal plants in that district. Plans are being completed with estimated cost of more than $15,000,000. Amtorg Trading Corporation, 261 Fifth Avenue, New York, official buying agency for Soviet Union, has information.

New Trade Publications

Alligator Shears.—Doelger & Kirsten, Milwaukee. Two illustrated circulars describing various types of "Milwaukee" all-steel shears for ordinary and also for heavy-duty service.

Tiering and Lifting Truck.—Automatic Transportation Co., Buffalo. Circular of 8 pages illustrating and describing a tiering and lifting truck of 10,000-lb. capacity. It is driven through spur gears, has an overall length of 134 in. and a width of 43 in. The platform may be raised from 11 in., its lowest position, to 75 in. from the floor.

Transformer Performance.—Wagner Electric Corporation, St. Louis. Bulletin 164 of 12 pages discusses the losses which occur in distribution and power transformers, the method of making tests on transformers to determine their acceptability and calculations of operating characteristics from the test data.

Lifting and Stacking Practice.—Lewis-Shepard Co., Watertown, Mass. Folder of 16 pages showing a large number of applications of the jacklift and stacker in industrial service. This is a form of elevating truck making it possible to utilize storage room from the floor to the ceiling.

Concrete Floors.—Master Builders Co., 7016 Euclid Avenue, Cleveland. A fifth ingredient in concrete, in addition to the time-honored cement, sand, stone and water, is the subject of this 28-page pamphlet. This ingredient, called "Omicron," is said to do away with the disintegration of floors under traffic or spillage. Omicron combines with the soluble constituent of the concrete to render it insoluble and thereby strengthen it and lengthen its life. A companion pamphlet, "Reducing the Ratio of Soluble Constituents in Portland Cement Concrete," was prepared by Dr. Lewis B. Miller, director of research of the company.

Regulator for Gas Producer.—Chowning Regulator Corporation, Corning, N. Y. Folder illustrating and briefly describing a regulator to operate a balanced steam valve controlling a gas producer. This is said to result in much more even flow of gas.

Metal Traffic Marker.—Metal Traffic Marker Corporation, 304 Hudson Street, New York. Aisle markers for industrial use or to indicate danger lines or safety zones, either indoors or out. These are made of monel metal and may be affixed to wood floors by a single central screw. For concrete or brick floors other means of attachment are provided.